


In
Honolulu
Gardens



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IN HONOLULU GARDENS

by

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Legends by BERTA METZGER

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IN HONOLULU GARDENS

INTRODUCTION

Honolulu is as noted for colorful and picturesque trees as for blue skies and bluer waters. People who like Hawaii think often of its graceful coco palms, avenues of shower trees that rain golden, pink, and rainbow petals, mountains dotted with the yellow-green of kukui trees. The blossoming of the night-blooming cereus is an event heralded in the newspapers, and all Honolulu takes as much interest in the event as the Japanese in their famous flower festivals. The trailing holokus and wide sun hats of the gracious lei women at the docks with their calls of "Leis! Leis! Maile leis! Ginger leis! Plumeria leis!" and the lei-laden guest waving good-bye from the steamer are familiar sights in Honolulu.

The early Polynesians in their long voyages from Tahiti brought in their canoes food plants, like the coconut, taro, and banana, and planted them in new island homes. Ever since the discovery of Hawaii by Captain Cook in 1778 plants and seeds have been brought from the eastern and western hemispheres, and they have become valuable for their fruit and shade, beautiful for their foliage and flowers, or useful for their timber. Others have been brought unintentionally as seeds in soil around roots of imported plants and have prospered as weeds, as also have some cultivated kinds that have escaped from gardens, as the guava and lantana. Consequently, the number of imported plants is great and in town exceeds that of native ones.

This book is designed as a floral guide of Honolulu. It treats the subject by no means exhaustively. The commonest and most conspicuous herbs, vines, shrubs, and trees that are seen in gardens and parks and along roadsides are described. Those omitted are either rare or inconspicuous, or are so familiar as not to need descriptions, as nasturtiums, geraniums, and begonias. The uses of many of the plants are given and reveal much in this age of synthetic products.

The names and home lands of the plants are based on the "Index

Kewensis." Their arrangement by families and genera is according to Engler and Prantl, those forms lowest in the scale of evolution coming at the beginning of the book, those highest at the end.

Besides descriptions, many legends of the plants are included. Polynesians love flowers, and they have numerous songs and chants about them. Many fragrant flowers and leaves were sacred to the gods. A Marquesan legend explains why flowers wilt. Koikoi loved the flowers and called them his sweethearts. When he died the flower women wept so bitterly that their tears seared their petals, and for the first time flowers wilted. From Tahiti comes the legend that the great god Taaroa shook off his feathers, which fell from the heavens and became trees, shrubs, and creepers to clothe the earth. The flowers of the Hawaiian islands are: Hawaii, lehua; Maui, rose; Oahu, *ilima*; Molokai, kukui. The plant of Lanai is the dodder; of Kahoolawe the *hinahina*, a shrubby silver-gray beach plant. Mokihana seeds are symbolic of Kauai, the Niihau shell of Niihau.

The work might be called a compilation, as little original material is used. The chief sources of information are standard works on botany, ethnology, and folklore, and literature on the Pacific. Additional information has been provided by residents of Honolulu. Mr. Edward L. Caum has given generously of his botanical knowledge. For their encouragement and advice many thanks are due to Dr. Herbert E. Gregory, Dr. C. Montague Cooke, Jr., Mr. A. F. Judd, Mr. C. S. Judd, Dr. F. B. H. Brown, and Dr. Willis T. Pope.

The legends, supplied by Berta Metzger, are largely from published and unpublished material in Bernice P. Bishop Museum, including a manuscript on Hawaiian proverbs. Except as otherwise noted the photographs used for illustrations are from negatives in Bernice P. Bishop Museum. The drawings were made by Marie C. Neal—most of them from living plants, but a few from photographs.

TREE-FERN FAMILY

(Cyatheaceae)

Cibotium, hapuu (*Cibotium chamissoi* Kaulfuss). Figure 1.—The *hapuu* is one of the commonest Hawaiian tree ferns; but it is not so

common on Oahu as on Hawaii, where in association with ohia lehua it forms many forests, both in dry and in damp regions. In Puna and near Kilauea Volcano, these ferns are especially abundant, the forest scenery being characterized by tall lehua trees with more or less flat crowns, bearing small gray-green leaves, which rise high above the arching leafy crowns of tree ferns scattered among them. It is estimated that the island of Hawaii has 400,000 acres of tree ferns, some with trunks as much as 16 feet high, but most lower. Their broad and intricately divided leaves, which are green or dull-white beneath, are somewhere between three and nine feet long. On their under side, fruit develops in cartilaginous boxlike cases, which open by a lid. The leaf stems are brown and smooth and have fawn-colored silky wool (pulu) densely covering their bases, wool similar to that of the *amaumau* and similarly used to fill pillows and mattresses. Young stems are mealy and formerly were eaten by native Hawaiians in times of famine. Another food, nearly pure starch, develops in the core of the tree, each tree producing 50 to 70 pounds. The trunks are used to pave forest pathways and for fences, and slabs cut from them are used to line baskets to hold orchids and other plants.—Grounds of Royal Hawaiian hotel; along upper Tantalus road.



FIGURE 1.—Tree-fern family: tree fern (*Cibotium chamissoi*).

Leaves.—Consistency of paper, 4-8 feet long, tripinnate, smooth, bearing thin scales above; below green or dull-white, ordinarily covered with pale cobwebby down; stem 4-8 feet long, brown, smooth, with dense, fawn-colored, fine, silky wool (pulu) at base; lowest pinnae 18-30 inches long, with 24-28 pairs of short-stemmed pinnules 5-6 inches by $\frac{3}{4}$ inch, pointed, pinnae acute, lower pinnules oblong and obtuse, entire, not bent back, veinlets not prominent. *Fruit*.—Sori 8-14 to a pinnule, round, at apex of a vein, marginal, in a prominent, leathery, deeply two-valved involucre; sporangia stemmed, spores tetrahedrous. *Home*.—Hawaii.

POLYPOD-FERN FAMILY

(Polypodiaceae)

Boston fern, sword fern, pamoho (*Nephrolepis exaltata* Schott).—From Florida to Brazil and from Hongkong to east Africa the Boston fern grows wild. In Hawaii it is common on banks near the edge of forests and on tree trunks and is cultivated for ornamental use around houses. Rising from the ground on light-brown stems, some having fine, threadlike appendages, are tufts of pale-green, papery leaves one to three feet long and a quarter to half a foot wide. The blade narrows below and above and is closely cut into 25 to 60 pairs of oblong leaflets, near the margins of which fruit is borne in tiny, round areas.—Grounds of Royal Hawaiian hotel.

Leaves.—Smooth, pale-green, papery, 1-3 feet by 3-6 inches, narrowing above and below, pinnate; leaflets, 25-60 pairs, oblong, blunt or sharp, curved, horizontal, 1/4-3/4 inch broad, hardly stalked, entire or with margins notched, base ending abruptly on both sides in lower pinnae, but lobed above and rounded below in upper pinnae; rhizomes underground and creeping, covered with long rusty scales; stems 2-6 inches long, light-brown, sparingly fibrillose or bare. *Fruit.*—Sori round, in a line near the margin, rising from the tip of upper branch of a vein; spores oval. *Home.*—Most tropical countries.

Lindsaya, palaa [*Odontosoria chinensis* (Linnaeus) J. Smith]. Plate I, B.—The plant called *palaa* by the natives is the commonest small wild Hawaiian fern. Formerly, Hawaiians extracted a red dye from the pretty, lacy leaves. Priests gathered the fern for certain ceremonies, and it was a good omen if they were caught in the rain after the fern was gathered. From an underground stem rise light-brown, smooth, shiny stems half a foot to a foot long, supporting smooth, oval, pointed leaves, which are as long as the stem or longer. Fruiting bodies are borne near the margin of the leaf divisions.—Roadsides, as along upper Tantalus road; in fields.

Leaves.—Oval, pointed, 1/2-1 1/2 feet long, smooth, papery, tripinnate; pinnae oval, pointed, rising obliquely, the lowest 3-6 inches long, shortly stalked; smallest divisions 1/4-1/2 inch, rhomboidal, near stalk cut into 3-6 narrow segments, which rise obliquely and are cuneate-oblong, truncate, veins inconspicuous, one to a segment, in some forking acutely near the apex; stems 1/2-1 foot long, light-brown, smooth, shiny, rising from underground creeping rhizome, which is covered with short, stiff, rust-colored threads. *Fruit.*—Sori nearly marginal, 1 or 2 at apex of the segment, covered by an indusium, which is half cup-shaped, shallow, with adnate sides; spores smooth, oval, 2-sided. *Home.*—Polynesia to Japan, to Madagascar.

Bird's-nest fern, ekaha, ekahakaha (*Asplenium nidus* Linnaeus). Figure 2, *a*.—In the lower forests in Hawaii the bird's-nest fern perches as a large, dark-green rosette of leaves on tree trunks and branches. In Honolulu it is cultivated both as a perching and tub plant. Long, smooth, leathery leaves on short stems, called "Maui's



FIGURE 2.—Polypod-fern family: *a*, birds-nest fern (*Asplenium nidus*), growing on date palm; *b*, polypodium (*Polypodium phymatodes*), back of leaf, showing fruit dots.

paddle" by Hawaiians, radiate from a common base, and when mature the under side of their upper ends are almost covered with fruiting bodies. In the old Hawaiian ceremony of cutting trees for canoes it was necessary to cover the stump with bird's-nest fern before the trunk could be adzed.—Grounds of Royal Hawaiian hotel; Makiki Valley, at nursery of Board of Agriculture and Forestry.

Leaves.—Leathery, smooth, 2-4 feet by 3-8 inches, with or without a short stem, the midrib prominent and well rounded beneath; veins very close, parallel, at nearly right angles to midrib. *Fruit*.—On nearly all veins in the upper half or two-thirds of the leaf, covering it from near the midrib to half or two-thirds the distance between midrib and edge. *Home*.—Polynesia to Madagascar.

Sadleria, amaumau (*Sadleria cyatheoides* Kaulfuss). Plate I, *A*. —The tree fern, *amaumau*, lives on all the Hawaiian islands, being common in mountains on Oahu and around Kilauea Volcano, where it grows both in forests and on recent lava flows. It is a small tree with trunk about five feet high, crowned with a cluster of smooth,

leathery leaves, dark-green when mature, red when young, which are ordinarily two to three feet long. They are not so intricately divided as those of the *hapuu*. The leaf stem is about half as long as the leaf, smooth, brown, and at the base is buried in a mass of brownish, soft scales (*pulu amau*), of use as stuffing for pillows and mattresses. Fruit is borne in abundance on the lower surface of the leaves. Some Hawaiian grass houses made of lauhala were trimmed with this fern, and the stems were used as sizing in making tapa. The *amaumau* was one of the forms that Kamapuaa, the pig god of Hawaii could take at will.—Beside upper Tantalus road.

Leaves.—Leathery, smooth, oblong, 2-3 feet long, dark-green (red when young), bipinnate; pinnae 30-40 pairs, 6-10 by 1/2-1 inch, pointed, deeply cut into about 40 narrow, slightly curved, pointed segments, with margins rolled backwards, veins hidden; stem 1-2 feet long, smooth, brown, at the base densely covered with brown or reddish, soft scales about 2 inches long, running out into a hairlike point. *Fruit*.—Sori extending to near the apex, at maturity covering the entire lower surface; spores bilateral, oval or nearly round. *Home*.—Hawaii.

Maidenhair fern (*Adiantum*, several species).—Many different kinds of that popular ornamental pot plant, the maidenhair fern, are present in Honolulu. They are easily recognized by their large or small leaflets, which are rectangular on many plants and are deeply lobed, having spores under inrolled edges. The leaves spread flatly from stiff, slender, shining, blackish stems. "Adiantum" is Greek for "unwetted," referring to the smooth, waterproof leaves. Maidenhair ferns like considerable shade and moisture and a warm climate, for the home of most kinds is in tropical parts of both hemispheres.

Polypodium (*Polypodium phymatodes* Linnaeus). Plate XI, A; figure 2, b.—From black, creeping, scaly stems marked with leaf scars a polypodium that is a common ornamental garden fern in Honolulu raises large, broad, dark-green fronds a foot to a yard high. They are divided deeply into several segments, those of the fruit-bearing fronds being narrower than those of the vegetative fronds. Both kinds are smooth except for a prominent midvein and lateral veins. On the upper surface of the fruiting fronds are elevations caused by rows on the lower surface of rounded hollows filled with spores. The fern is common in tropical regions of the Old World.—Grounds of Royal Hawaiian hotel; 1060 Lunalilo Street.



A



B

PLATE I. *A*, SADLERIA (SADLERIA CYATHEOIDES); *B*, LINDSAYA (ODONTOSORIA CHINENSIS).



A



B

PLATE II. A, CYCAD (*CYCAS REVOLUTA*), BEARING MALE FLOWERING CONES; B, CYCAD (*CYCAS CIRCINALIS*), NOTHOPANAX HEDGE IN BACKGROUND

Leaves.—Jointed to rootstocks, 1-3 feet long, deeply pinnatifid, segments almost triangular, dark-green, very smooth; fertile fronds with narrower segments, nearly pinnate; segments lanceolate, 4-8 by $3/4$ -1 $1/2$ inches, at base joining a broadly winged rhachis; midvein and midrib of each segment prominent, finer veins forming an inconspicuous network. *Fruit*.—Sori naked, round or oval, rather large, distant, ordinarily in 2 rows, a few in 1 on each side of midrib, receptacles excavated, prominent on upper surface. *Home*.—New Guinea.

Staghorn fern (*Platycerium alcicorne* Desvaux).—In temperate Australia, New Caledonia, and eastern Africa a staghorn fern that is one of the commonest ferns used decoratively around houses in Honolulu is at home. Good examples can be seen attached to trees on Keeaumoku Street near Wilder Avenue, at 50 Judd Street, 830 Lunalilo Street, and in other parts of the city. In some countries it has been cultivated since ancient times. Its leaves without fruiting bodies are wavy margined and rounded, and are not antler-like as in the large staghorn fern (*Platycerium grande*). The leaves bearing fruiting bodies are clustered, grow two to three feet long, and fork two to three times, hence "platycerium," meaning "broad horn." Fruiting bodies develop in irregular masses and fill the last forks. The rounded basal portion (about three inches in diameter) stands erect, and its ragged segments hang down, being rather narrow and sharply cut and covered with a thin cottony down on the under side. When young all parts are covered with down.

Staghorn fern (*Platycerium grande* J. Smith).—A large staghorn fern is used rather uncommonly as a decorative plant around houses in Honolulu. Its blunt, thick, spongy fronds resemble in shape the antlers of a stag. Those that are fruitless are stemless, and the lower part of the leaves adheres to ground, tree, or basket by flat, rounded expansions of the leaves. In northern Australia, the native country, many of these ferns grow on the surface of trees and form large nests. Fruiting leaves are huge and hang in pairs a yard or two long.—In a few gardens.

Leaves.—Unfertile: stalkless, like stag's antlers, thick, with blunt, spongy, pale-green segments covered with matted hairs, irregularly lobed, with flat, rounded expansions about 8 inches in diameter adhering closely in layers to ground or tree; fertile: in pairs, 3-6 feet long, forking many times. *Fruit*.—Sori borne at upper edge of disc, with infertile fork projecting beyond on each side. *Home*.—Northern Australia, Malaysia.

VINE-FERN FAMILY

(Gleicheniaceae)

Staghorn fern, uluhi [*Gleichenia linearis* (Burmamn) Clarke; synonym, *G. dichotoma* Hooker].—In many tropical islands and countries of the Pacific flourishes the so-called “staghorn” fern. In Hawaii at elevations between 500 to 3,000 feet it covers large areas with dense thickets. It grows abundantly on Tantalus, where, as elsewhere in the mountains, it seems to be smothering vegetation or preventing the growth of other kinds. It advances over the ground by means of underground rootstocks and raises wiry leaf stems that fork repeatedly in zigzags, only the last pair bearing leaves, which are divided into many narrow segments.—Slopes of mountains, Nuuanu and Manoa valleys.

Leaves.—Borne on last pair of branches, 6-9 by 2 1/2-4 inches, pinnate; pinnae at right angles to stem, hardly 1/4 inch broad, the inner or upper ones shortening towards the base, the lowest one on the outside and bent downwards and generally larger; whitish beneath, veins with 3-5 parallel branches; buds between forking branches, small, covered with brown wool; stems zigzag, repeatedly dichotomous. *Fruit*.—Sori nearly round, at tip or back of a vein; 2-6 sporangia surrounded by a broad transverse ring, opening vertically; spores oval. *Home*.—Tropics in both hemispheres.

It is only natural that plants so much used as ferns should have a wealth of folklore. According to Maori tradition, fern root was the principal food of those people until the sweet potato and taro were brought from far Kahiki. If they pounded fern root at night they believed that their heads would be pounded by an enemy. Sweet potato was the food for peaceful times; the fern for war. Fern root was the gift of Mother Earth, who said to men, “I will provide sustenance for you. A child is born of the female parent, and is fed on the milk of the mother and attains manhood. Even so is man fed by his ancient mother, the earth.” In Hawaii the sweet-scented fern was used in religious ceremonies at the temples. The fern was also sacred to Laka, gracious goddess of the hula. In the battle between Hiiaka, sister of the volcano goddess, and the dragons, the friendly ferns twisted and twined around the legs and bodies of the dragons in order to help Hiiaka.

A legend of Little Russia tells of a peasant whose cattle strayed on the Eve of Saint Agnes. As he sought for them he passed a fern, part of which fell into his shoe and gave him the power to see where

his cattle were and the hiding places of many treasures. When he returned home the devil spoke through his wife and said, "Change your stockings." The peasant took off his shoes and stockings, the piece of fern fell to the ground, and he forgot all he had learned. There is an old European belief that fern spores have the power of making one invisible, and in Canada it is said that the person who breaks the first fern frond of spring will have good luck. Alaskan legend tells of several girls who were imprisoned by a falling cliff. A bird pecked open a hole, through which all escaped except the last girl, whose head as she was emerging became the first fern stem.

CYCAD FAMILY

(Cycadaceae)

Cycad (*Cycas circinalis* Linnaeus). Plate II, *B*.—One of the cycads is a sturdy, short, ornamental plant, its nearly smooth, brown trunk topped with an open rosette of long, stiff, gracefully arching leaves. It reaches a height of 15 feet or more in Hawaii, and its wide, finely divided leaves may reach a length of 9 feet. Ordinarily single, the trunk branches or forks after the top is cut off. Smooth, orange-red nuts are produced on some trees, and though poisonous to eat raw, they can be ground into a flour from which cakes can be baked. From the trunk is obtained a sago-like starch. This cycad grows wild in India, Ceylon, and Guam, where it reaches twice the height it has in Hawaii. It does not seem particular as to habitat. For in Ceylon it is present in moist parts up to 1,500 feet, in Guam in calcareous, sandy soil down to the water's edge.—Several lawns on Kewalo Street, between Wilder Avenue and Lunalilo Street.

Leaves.—Dark-green above and pale beneath, 5-9 feet long, finely pinnate; pinnae up to a foot long, $1\frac{1}{2}$ inch wide, falcate, pointed; stem $1\frac{1}{2}$ -2 feet long, with short, deflexed spines near base. *Flowers*.—Massed in the middle of the crown of leaves, dioecious, wind pollinated; male: pollen in sacs on the many scales composing a cone 1-2 feet long, scales $1\frac{1}{2}$ -2 inches long, tipped with a spine 1 inch long, red-brown; female: ovules in 3-5 pairs near end of long stalks, which are clothed in buff wool and have spiny or scalloped margins. *Fruit*.—Nuts smooth, orange-red, producing a sexual generation, which yields the vegetative plant. *Home*.—Moluccas.

Cycad, sago palm (*Cycas revoluta* Thunberg). Plate II, *A*.—A small, easily but slowly growing cycad is rarely seen more than three

feet high. Besides being of smaller size than the other kind of cycad common in Honolulu, it has narrow, sharp leaflets with edges rolled back. The leaves are much used ornamentally at funerals. Because of the sago-like starch obtained from its trunk the plant is called "sago palm." But it is not a palm; that name belongs rightfully to a sago-producing palm from southeastern Asia.—Japanese Hospital, Kuakini Street; corner of Kapiolani and Lunalilo streets; 2326 Oahu Avenue.

Leaves.—Rather stiff and thick, shining, dark-green, recurved at the end, 2-7 feet long, pinnate; leaflets narrow, sharp, numerous, curved downwards, edges revolute. *Flowers*.—Massed in the middle of the crown of leaves, dioecious; wind pollinated; male: erect cones, consisting of round scales, bearing round pollen sacs beneath; female: resembling pinnate, notched, fuzzy leaves, with seeds in the notches. *Fruit*.—Seeds producing a sexual generation, which yields fruit developing into a vegetative plant. *Home*.—Japan.

CONIFER FAMILY

(Coniferae)

Queensland kauri, dammara (*Agathis robusta* C. Moore). Plates III; X, B.—The dammara is a stately conifer that is most at home in dense forests in Queensland, where some are 150 feet tall. In other countries it has been cultivated, as in Ceylon, where it grows at elevations between 1,500 and 5,000 feet, and in California. A few have been planted in Honolulu and are growing well. Outside of Australia the tree may not have seed-bearing cones. Branches spread more or less horizontally from the trunk, two or more together, and are clothed with oval or oblong, stiff leaves. The bark yields dammar resin or gum, which is used in making varnish.—Thomas Square; Lincoln School; park at corner of King and Keeaumoku streets; across from the Post Office, on Mililani Street; corner Punahou and Young streets.

This tree has a close relative in New Zealand (*Agathis australis*), which does not thrive in the warm Hawaiian climate and none of which is growing in Honolulu. A few are growing in Waiahole, Oahu, where they do not seem to feel at home.

Leaves.—Oval or oblong-lanceolate, obtuse or shortly pointed, round or tapering at base, 2-4 inches long, rigid, leathery, finely striate, thick, flat, spirally arranged; stem short. *Flowers*.—Sexes separate; male catkin-like, about 1 1/2 inches long, axillary or lateral, stemless, with round or kidney-



PLATE III. QUEENSLAND KAURI (*AGATHIS ROBUSTA*).



PLATE IV. MONKEY PUZZLE (*ARAUCARIA BIDWILLII*), PART OF
CENTURY PLANT AT LEFT.

shaped bracts about $1/6$ inch in diameter at base, stamens many; female cone oval to round, terminal or lateral, about 4 by 3 inches, with many broad scales having winged margins and thick tip. *Fruit*.—Ripened female cone, scales falling off; seeds flat, oblong or wedge shaped, nearly $1/2$ inch long. *Home*.—Australia.

Araucaria, monkey puzzle, bunya or bon-yi (*Araucaria bidwillii* Hooker). Plate IV.—One of the smaller araucarias is a native of northeastern Australia, where some exceed a height of 100 feet. In the United States it is used as a pot plant. The wood is like that of the hoop pine and is similarly used in Australia. Its shape is beautifully regular, broadly dome shaped at the top, and it is easily distinguished from other close relatives by its many long branches, the lower of which droop and are borne on the trunk down near the ground. The name “monkey puzzle” refers to the numerous branches, through which it would puzzle a monkey to climb. The scaly, stiff, stemless leaves as well as the branches are distinct, being about two inches long, oval, and ending in a sharp point. They are arranged in spirals and are very coarse. The cones, which are pineapple shaped and are seldom seen in Hawaii, may develop to a huge size, weighing as much as ten pounds. The seeds in them are roasted and eaten by the blacks of Australia.—Thomas Square; Capitol grounds.

Leaves.—Scaly, stiff, spirally arranged, unstalked, ovate with sharp tip, nearly 2 inches long, shining. *Flowers*.—Sexes separate; male catkins at end of branches, 6 inches by $1/2$ inch; female cones large. *Fruit*.—Cones, some in Queensland 12 by 9 inches and weighing 10 pounds. *Home*.—Queensland.

Norfolk Island pine (*Araucaria excelsa* R. Brown). Plate V. —A dignified, tall, dark tree conspicuous for its shape and color in the plant population of Honolulu is the Norfolk Island pine. In many places in the city it rears its narrow cone shape above its neighbors. In the mountains it serves well for reforestation. Its branches spread horizontally in widely separated tiers, and while it is high, neither this tree nor others of its kind in Hawaii has yet had time to rival examples in its home, Norfolk Island and Australia, where some exceed 200 feet in height and attain a diameter of 10 feet. It thrives well in some foreign lands. After trying out its adaptability as an immigrant in Belgium, nurserymen found that it prospered so well that trees are raised there extensively and exported

to different countries. In the United States, small ones are grown as pot plants. In Hawaii this conifer is commoner than the similar Cook pine.

On branches that do not bear fruit the leaves are flattened laterally and are straight or curved and pointed. On fruit-bearing branches they are shorter, triangular, and pointed. Woody, round or oblong cones develop at branch ends.

Araucaria, Cook pine (*Araucaria cookii* R. Brown). Plate V. —An araucaria, named in honor of the navigator, Captain Cook, has its home in New Caledonia and the Isle of Pines. There it forms large forests and raises its cone-shaped crown as high as that of the Norfolk Island pine. It is so much like that pine in many other respects that the two are difficult to distinguish.

Cook records that as his ship approached the Isle of Pines the men on board could not agree what the elevated objects on shore were. He supposed them to be a singular sort of trees. Others thought they were pillars of basalt "like those which compose the Giant's Causeway in Ireland." Closer, "they had the appearance of tall pines which occasioned my giving that name to the island."

The leaves, short, elliptical, rounded, and broad, are alternate and run down the stem. Only the old leaves, which are short and oval, are close together, and they overlap. The cones are 3 to 4 inches in diameter and somewhat longer.

Richmond River, hoop, colonial, or Moreton pine; coarong (*Araucaria cunninghamii* Aiton). Plates VI; XXIV, A.—One of the tallest Australian pines lives on the rough slopes of mountains and on river banks and at home reaches a height of 200 feet and a diameter of 6 feet. In Honoulu it has not attained such proportions. In outline it is nearly triangular, though the crown is flattened. Its branches are more spreading and more nearly horizontal than those of *Araucaria cookii*. The wood is white and is used for furniture. It is called "hoop pine" because the bark is banded horizontally. In the bark is a gum and also a transparent white resin, which is known to hang down like icicles as long as a yard and as wide as a foot.—Thomas Square; Capitol grounds; in front of buildings of Board of Agriculture and Forestry, King Street, corner of Punahou and Young streets.



PLATE V. NORFOLK ISLAND PINE (?) OR COOK PINE (?). ROYAL AND
COCONUT PALMS AT LEFT, DATE PALM AND ALGAROBA
AT RIGHT BACKGROUND.



PLATE VI. HOOP PINE (*ARAUCARIA CUNNINGHAMII*).

Leaves.—Two kinds; on upper branches crowded and spirally arranged, stiff, pointed, $\frac{1}{3}$ inch long; on lower branches spreading, vertical, longer than 1 inch. *Flowers*.—Sexes separate; male: cylindrical catkins 2-3 inches long; female: cones, ovate. *Fruit*.—Cones egg-shaped, 4 by 3 inches. *Home*.—Eastern Australia.

Cryptomeria, Japanese cedar, sugi, tsugi (*Cryptomeria japonica* D. Don).—On a mountainous island of Japan, Yaku, the government is preserving a primeval forest of *tsugi*, the largest of Japanese trees. It grows on the higher parts of the island, while tropical plants grow on the lower. Large dimensions are reached by the tree there, and the largest one was found to have more than 1,600 annual rings. In height some reach 120 feet, in diameter 40 feet, in some climates a height of only 20 feet.

The tree has a long straight stem covered with reddish-brown bark and yields a valuable lumber, white and soft, with an odor like cedar. In Hawaii it is used chiefly for reforestation, as on the uplands of Haleakala, growing best in a cool climate. In Honolulu young trees are used for Christmas trees.—Tantalus; Makiki Valley, nursery of Board of Agriculture and Forestry.

In Japanese legend the cryptomeria is said to be the home of the Tengus, the vampires of the air. Once a man and his servant were searching for a lost horse. In a familiar meadow they were amazed to see a large cryptomeria tree that had never been there before. They shot arrows into it, and it disappeared. Where the tree had been they found a dead fox, which was the abode of the evil spirit, with cryptomeria twigs in its mouth. Another legend tells of Yenogi, who for twenty years had guarded the god, Fudo, who could be seen only by the high priest. One day the shrine doors were ajar. Yenogi peeped, and he was turned into a long-nosed creature with one eye. In a year he died and his spirit passed into a cryptomeria tree near the shore, which was invoked by sailors in distress, for if a light blazed from "the tree of the one-eyed priest" the storm would abate.

Leaves.—Blue-green, $\frac{1}{2}$ -1 inch long, linear-awl-shaped, compressed, slightly 4 or 3 angled, slightly curved, decurrent at base, spirally arranged. *Flowers*.—Sexes separate; male: oblong, yellow, in short racemes at end of branches; female: round, solitary, at end of short branchlets. *Fruit*.—Cone, brownish-red, $\frac{3}{4}$ -1 inch across, round; scales thick, wedge shaped, recurved point on back and pointed lobes at apex, each with 3-5 narrow-winged erect seeds. *Home*.—Japan.

Arbor vitae (*Thuja orientalis* Linnaeus).—A symmetrical, bushy tree, spreading below and tapering to a point at the top, which may be as high as 25 feet from the ground, is an Asiatic arbor vitae. It is a stiffly ornamental evergreen tree of the Temperate Zone; but a few are growing in Honolulu. The branches are horizontal with ascending ends, are much subdivided, and bear numerous branchlets with a frondlike arrangement, being flattened and covered with small scaly leaves. Many slightly different garden forms are known. The cones are small, rounded-oval, and as much as one inch long. It is a smaller tree than the arbor vitae from America and has larger cones. Otherwise, except in some less conspicuous features, the two kinds are much alike.—In a few gardens.

In a small garden in the Forbidden City of Peking grew an arbor vitae that was said to be the "life tree of the Manchu Dynasty." It was never trimmed or touched by an axe, for that would affect the power of the Manchus, whose might and well-being were identical with that of the tree. For a long time after it became old it was held up by props. Like the Manchu Dynasty, it must be quite dead by this time.

Leaves.—Rhombic-ovate, acute, bright-green with small gland on back, on branches spreading in a vertical plane with both sides alike. *Flowers*.—Round, small, at end of short branchlets, sexes separate on the same tree; male: yellow, mostly with 6 opposite stamens; female: 8-12 scales in opposite pairs, of which only 2 pairs are fertile, each with 2 ovules at base. *Fruit*.—Cones, globose-ovate, 1/2-1 inch long, upright; scales ovate, thick, about 6, each with a hornlike process below the tip, uppermost pair sterile; seeds wingless. *Home*.—Persia to eastern Asia.

Cypress (*Cupressus sempervirens* Linnaeus). Plate VII.—Seeming aloof because tall and slender, the cypress raises its sharply pointed silhouette here and there in Honolulu. It has little expression except perhaps a quiet mournfulness and reminds an admirer of Böcklin of his beautiful picture, "The isle of the dead"—shapely velvety cypresses beside a marble tomb. It is a native of Europe, where it is common, and of Persia, and in both of these countries it rises to as great a height as 80 feet.

The Romans dedicated the cypress to Pluto because it never grew again after it was cut. It is said that the Turks plant a cypress at the death of a child. It seems strange that Hebe, goddess of youth, should have a grove of cypresses sacred to her, as classical mythology

records. Persian legend tells of two cypress trees that sprang from shoots brought from Paradise by Zoroaster. They were held sacred by magicians. When Cyparisso, a youth loved by Apollo, killed a pet stag, he was so grief-stricken that Apollo, in pity, changed the lad into a cypress.

Cypresses are famous for their longevity, some, it is claimed, living more than 2,000 years. One tree at Lago Maggiore with a circumference of 54 feet was considered very old 600 years ago. For commercial uses the wood is valued, as it is almost imperishable. Besides passing high in the test for endurance, in the course of its gradual expansion through hundreds of years, when storm winds shake it and gentle breezes pass through it, the wood might suitably become an exponent of music. And one of its uses is for musical instruments.

The steeply rising branches divide into quadrangular branchlets, which bear dark, evergreen leaves, as small scales, having an aromatic odor. Round cones develop slowly, bearing many seeds, which do not ripen until the second year.—2448 Manoa Road; 2447 Parker Street; Scottish Rite cathedral.

Leaves.—Small scales, dark-green, minutely toothed or hairy, aromatic, opposite, glandular, blunt, ovate, appressed; young leaves long and spreading. *Flowers*.—Minute, solitary, on short branchlets, sexes separate; male: oval or oblong, yellow; female: nearly round. *Fruit*.—Round to oblong cones with 3-7 pairs of woody scales, bearing a short boss on the back, each scale, except the lower sterile ones, bearing many seeds. *Home*.—Europe, Persia.

Mourning cypress (*Cupressus funebris* Endlicher).—Though similar in most ways, in its spreading and gracefully drooping branches, the mourning cypress differs from the slender-formed cypress. Also, it is not so tall, the branchlets are flattened, and the leaves differ in shape and are light-green. For nearly a century this tree, which is from the Orient, has been cultivated in Europe. In Honolulu, several are growing in cemeteries.—Catholic cemetery, King Street.

In China the cypress and pine are considered to have more vigor than other trees, and for that reason they are often planted on graves to strengthen the soul. A poem attributed to Mei Sheng, an ancient poet of China, shows that in the Orient also sadness is felt on beholding the cypress:

Green, green,
 The cypress on the mound.
 Firm, firm,
 The boulder in the stream.
 Man's life within this world,
 Is like the sojourning of a hurried traveler.
 A cup of wine will make us glad,
 And a little friendship is no little matter.

Leaves.—Light-green, deltoid-ovate, pointed, some spreading at the tip, otherwise like *Cupressus sempervirens*. *Flowers*.—Like those of *C. sempervirens*. *Fruit*.—Round, about $\frac{1}{3}$ inch in diameter, 8 short-pointed scales, otherwise like *C. sempervirens*. *Home*.—China.

Monterey cypress (*Cupressus macrocarpa* Hartweg).—Ordinarily as a tree about 40 feet high, the Monterey cypress may raise its broad head with horizontally spreading branches to an even greater height. Not many have been planted in Honolulu, and none has attained the picturesqueness of those on the California coast. But several have been planted outside the city, on homesteads. They are used ornamentally and for windbreaks.—2859 Manoa Road.

Mexican legend tells of a fish-god who clung to a cypress tree and remained alive to repeople the earth.

Leaves.—Rhombic ovate, obtuse, closely appressed, not glandular or obscurely so, dark or bright green. *Fruit*.—Cones round or oblong; scales 8-12, with short, obtuse boss on the back. *Home*.—South of Monterey Bay, California.

Cypress (*Cupressus arizonica* Greene).—Arizona is the home of a cypress covered with grayish-blue foliage. Few trees grow much higher than 40 feet; all have branches spreading horizontally and forming at the top a pointed or broad crown. The leaves are small, oval, and blunt, and are thick at the tip. The fruit consists of nearly round cones about an inch in diameter with six or eight scales, which are provided with pointed, curved knobs. A few of these cypresses are growing on Likelike Street, beside the Library of Hawaii.

Bermuda cedar, juniper (*Juniperus bermudiana* Linnaeus).—As a medium-sized, stiff-looking tree, the Bermuda cedar is seen in Honolulu singly or in hedges, especially in formal gardens, as in parks. But it is not so common as in a temperate climate. It likes

open places and moderately moist soil, but will grow also in rather dry, rocky ground. At 1930 Ualakaa Street is one.

The tree is cone shaped and has short, thickly set, quadrangular branchlets and pale bluish-green foliage. It closely resembles the cypress, from which it can be distinguished, however, by the juvenile leaves, the upper side of which has white marks, in cypress being white below. The young leaves are needle-like and are sometimes mixed with the small scalelike leaves found on adult plants. Male and female flowers grow on separate trees, the male as yellow catkins, the female as tiny green balls that develop into two-seeded berry-like cones. Ordinarily, these do not germinate till the second or third year. The wood is fragrant and close-grained and is used as an interior finish of houses, for posts, and small articles, as pencils.

In other countries several kinds of junipers are cultivated, and in some formal gardens they are cut in fantastic shapes. In the Tyrol, juniper berries are burned in the houses the last three days of April to free them from witches on May day.

SCREW-PINE FAMILY

(Pandanaceae)

Ieie, climbing screw pine (*Freycinetia arborca* Gaudichaud). Figure 3, *a*.—In the lower woods of Hawaii, between 1,000 and 2,000 feet, the *ieie* is common, a tropical-looking climber with brittle, woody stems, about an inch in diameter and marked with rings. It climbs vigorously, even to tree tops, and over the ground, forming impenetrable thickets, which to a great extent smother and prevent the growth of other plants. Every two or three feet branches are sent out that end in tufts of narrow leaves, spirally arranged. From the center of each tuft a large scarlet inflorescence develops in season. Its long, aerial roots were formerly woven by Hawaiians into baskets. In New Zealand is a close relative, called *kickie*, the flowers of which the natives eat.—Upper Tantalus road.

The *ieie* was formerly considered sacred and was dedicated to ceremonial purposes. To the Hawaiians the forking *ieie* was similar to lightning. An invocation to the gods runs, "The *icie*, the *ieie*; the lightning, this is the *ieie*." There is a Hawaiian story of Lau-kaieie (leaf of the *ieie*), a beautiful maiden cared for by the goddess

Hina. Laukaieie was given to a lonely couple, and her playmates and servants were the birds and flowers. She married a bird-man, and soon the time came for her to change form. Her eyes flashed fire, leaves sprouted on her slender body, and her husband carried her to the woods with the words, "You cannot stand alone. Climb trees! Twine your long leaves around them. Let your blazing red flowers shine between the leaves like eyes of fire! Give your beauty to all the ohia trees of the forest." And so the maiden became the *ieie* vine.

Leaves.—Stiff, leathery, shining, forming tufts at ends of branches, 1 1/2-2 1/2 feet long, 1 1/2 inches wide at base, where they encircle the stem, tapering to pointed end; margins fine toothed, midrib keeled. *Flowers*.—Sexes on separate plants; male: on 2-4 terminal, cylindrical spikes about 6 inches by 1/2 inch, stamens orange; spike surrounded by a rosette of rose-colored, thick, ovate, pointed, soft bracts, the largest 10-15 by 2 1/2 inches; female: similar to male in appearance, the divisions having 2-4 rudimentary stamens and 5-10 kidney-shaped stigmas arranged in a circle or ellipse. *Fruit*.—Oblong, 8-10 inches long. *Home*.—Hawaii.



FIGURE 3.—Screw-pine family: a, *ieie* (*Freycinetia arborea*); b, *pandanus* (*Pandanus tectorius*).

Pandanus, screw pine, *hala* (*Pandanus tectorius* Solander). Plate XXV; figure 3, b.—Formerly perhaps the plant most useful to the Hawaiians was the *hala*. From sea level to an elevation of about 1,800 feet it grows in Hawaii, and where standing alone appears as a picturesque, strange-looking tree. In places it forms groves, as at the head of the Kahana Valley, Oahu, and near the black-sand shore of Waipio Valley, Hawaii. It is planted to some extent on lawns in Honolulu.

The hala is small, ordinarily 10 to 20 feet high, and it branches repeatedly in pairs, the last branches ending in large tufts of long, narrow leaves, which are spirally arranged. They are called "lau-hala" (leaf of the hala), which when dry and brown furnish material that is woven into floor and table mats, baskets, and fans, uses to which the leaves have been put from ancient times. Radiating downwards from the whitish, ringed trunk and from some branches extend several stiff, straight, aerial roots. *Hinano* is the Hawaiian word for the male flowers, *puahala* for the female flowers and the fruit. Both kinds are fragrant, especially the male flowers, which grow on separate trees from the female; in Java this scent is valued as a perfume. The ripened female flower, which is the fruit, resembles a pineapple in appearance and size and is composed of many orange, smooth sections. After these are cut out they may be strung together in leis, which are popular because of their color and fragrance. In former times they were used also for paint brushes for tapa, as a strong fiber underlies the pulp. In Hawaii they were also eaten, but only incidentally. In some other parts of the Pacific, especially in the Tuamotus and in Micronesia, the fruit has been the most important food.—Corner of Judd and Liliha streets.

According to a Melanesian myth the hala was the cause of the creation of mankind. A goddess was shaving hala strips and cut her finger. The blood formed two eggs that burst and from which stepped the first man and the first woman, the parents of the human race. In New Guinea mythology a demigod stepped from a hala and became the sun. Fijians say that the spirits leap into the underworld from a hala. Hindus use the hala flower in ceremonies to Pulliar. The Honolulu Academy of Arts has planted the hala generously on its grounds as being symbolic of the many cultural root-stocks from which Hawaii draws nourishment.

Hawaiian sayings: "Her children are like the many-rooted hala of the mountain side," a way of saying that a mother has devoted children. "Puna is dizzy with fragrance [of the hala flower]," used in praise of a well-formed person. "Thou art a pandanus necklace about the neck of the wise"; "when the hala is ripe, the sea urchins are fat," refers to old people depending upon the riches of a youth.

Leaves.—Crowded in spiral tufts at ends of branches, 3-5 feet long, about 3 inches wide at base, from which they taper to the pointed tip, leathery, smooth except for short spines at margins and midrib, shining. *Flowers.*—

Sexes on separate trees; male: on a hanging spike 5-6 inches long, stamens 10-15, strong scented; spikes surrounded by white, ovate, pointed, large, concave bracts; female: on a solitary, green spike, round, as large as a child's head, composed of 50-80 sections, which are 1 1/2-1 inch broad outside and narrow inwards, spike surrounded by 3 sets of white bracts. *Fruit*.—Rounded orange head, the ripened female flower, fibrous, pulpy, edible, each section composed of 5-12 carpels. *Home*.—Hawaii to Arabia.

Pandanus (*Pandanus veitchii* Hortorum).—Some pandanus trees with variegated leaves are growing ornamentally in Honolulu. If not pruned they form large, round, bushy clumps, in other respects resembling the ordinary pandanus. The tree grows wild in some parts of Polynesia, where it is native.

Pandanus (*Pandanus sylvestris* Bory).—A beautiful, pyramid-shaped pandanus cultivated to some extent in Honolulu is so shaped because of its manner of branching; the branches come out horizontally and decrease in length upwards. It comes from Reunion Island.

A few other species of pandanus are rare in Honolulu. An interesting collection is growing behind Hawaii Hall, University of Hawaii.

GRASS FAMILY

(Gramineae)

Job's tears, tear grass (*Coix lacryma-jobi* Linnaeus). Figure 4, *b*.—Job's tears is a flexible, jointed, annual plant with leaves and stem like those of Indian corn, its relative. But it is much smaller than corn, growing only one to two feet high, rarely five feet. The tear-shaped seeds, which it bears in abundance, are the cause of its name. These nod on a long stem, and their shining, hard covering ripens from green to jet-black or bluish-gray, becoming white with age. When the fruit is green, the female flowers are found within it, while the male flowers with orange pollen grow in separate clusters. The plant likes damp places and grows wild near ditches in Honolulu. As an ornament it is cultivated in some countries and in India for food by some hill tribes, the seed being high in carbohydrates.—School Street between Liliha and Palama streets; beside Tantalus trail; roadside upper Manoa Valley.

Today in Hawaii leis are made from the seeds, which are gathered from wild plants. Early writers mention them as being strung and used as ear drops in the south Pacific. In Ohio many years ago it was believed that a necklace of Job's tears would cure goiter. In New England teething children sometimes wore a necklace of these seeds for their curative value. It was also believed to cure sore throat and diphtheria, and it is reported that a mother brought a string of these seeds to a druggist and pointed out to him an incrustation that she declared was the essence of the illness that had been drawn from her child's body by the necklace.

Leaves.—Vary from 4-18 by 1-2 inches, narrowing from a broad indented base to pointed tip, smooth, margins toothed, midvein large, other veins many and slender, sheaths long and smooth. *Flowers.*—Male in spikelets arranged mostly on 1 side of stem, overlapping, variable in size, 1/2-3/4 inch long, anthers orange-yellow; female in racemes 1-2 1/2 inches long; peduncles long, enclosed in nearly round, hard, green covering. *Fruit.*—Oval to round, 1/4-1/3 inch in diameter; hard, bony covering ripening from green to black or gray and becoming white. *Home.*—Tropical Asia.

Sugar cane, ko (*Saccharum officinarum* Linnaeus). Plate VIII, A.—The plant family furnishing most of man's food, directly or indirectly, is the grass family, and an important representative of it is the sugar cane. Cane has been cultivated since prehistoric times in all warm countries for the sugar in the juicy stems. To Hawaii, where first it was brought in canoes by the early Polynesians, it is a great source of wealth and employs for plantations alone 49,000 people. In all countries, sugar cane grows best rather near the sea, in Hawaii as high as 2,800 feet on the leeward side of the islands, on the windward side 1,000 feet lower. In lowlands it ripens in 12 to 15 months, higher up in 18 to 30 months. It is grown profitably as far north as latitude 30° to 36° in China, Japan, and the United States. In India and the south Pacific islands large amounts are grown.

Too much rain or irrigation results in lessened sugar content in the plants. The yield of sugar from an acre of cane should be about 6 tons, extremes 2 and 16 tons, depending principally upon time of harvesting and amount of rainfall. After being removed from the cane by going through the mill, raw sugar is sent to the United States for refining. Ordinarily a field is prepared for harvesting by burning, which removes the leaves. Refuse cane

or bagasse from the mill is a useful biproduct, electricity for running sugar-mill machinery and for lights sometimes being produced from fuel furnished by it.

The smooth, woody stems of cane plants stand 6 to 12 feet high and are marked off regularly with ringed nodes. The internodes are filled with a juicy, sweet pulp, from which commercial sugar is extracted. The top of the stem is sheathed with clustered leaves, which are an inch or more broad and rough edged. In flowering season (the cane is best for harvesting just before the flowers appear) a purplish-red to gray-silver silky tassel, a foot or more long spreads at the top of the stem. The fruit is a small seed, but the plant is raised from cuttings. Usually five crops grow from one planting. Of the varieties of sugar cane raised in Hawaii, many have stems of different colors, some green, some red, some yellow or striped. Old Hawaiian varieties, which are becoming extinct, are also differently colored.—Plantations near Red Hill.

The Hawaiians had names for at least forty varieties of sugar cane. One had the name of "quarreling," or *hoo pa a pa*, because two men quarreled over what it should be named. Another was called *manulele* or "flying bird," because it was used in bringing a wife's love back to her husband. Certain sugar canes and fish of Hawaii have corresponding names and colors. The flower stalks of sugar cane were used as arrows in a popular gambling game. Even today the sugar cane is munched like stick candy by the children of Hawaii. In the Punjab, India, the first of the sugar cane cut is offered to the sugar-cane god. According to the Tahitians sugar cane was produced from the human spine, which accounts for the jointed stems.

A myth from the Solomon Islands states that two knots grew on a stalk of sugar cane. The cane burst, and from the knots stepped a man and a woman, who became the parents of mankind.

Hawaiian proverbs: "The sugar cane is growing white"; tactful way of saying that one is growing old. "The sugar cane flowers; time for the squid to appear." "When the sugar cane tassels, gather at the sledding course"; refers to the grassy hillsides that were used in this sport.

Leaves.—Alternate, long, very rough at the edges, 1 inch broad or more, parallel veined, sheathing the stem. *Flowers*.—In compound tassels, 1-3 feet long, reddish to silvery due to long silky hairs surrounding the paired and

one-flowered spikelets; each spikelet with 3 or more bracts arranged alternately on opposite sides of the spikelet; upper flowering bracts each enclosing a small scale containing the flower, which has 2-3 minute scales, stamens, and pistil. *Fruit*.—Seedlike. *Home*.—Possibly eastern tropical Asia.

Piipii, pilipiliula (*Rhaphis aciculata*). See page 305.

Pili (*Heteropogon contortus* Beauvois).—*Pili* is a forage grass spread through the Tropics and is common in some locations in Hawaii. Formerly Hawaiians used it for making grass houses. Bees manufacture colorless honey from the flowers. The plant grows two to three feet high in tufts without creeping stems. The leaves ordinarily are folded. The flowers are clustered in narrow heads that rise well above the leaves and are made ragged looking by slender, bent processes about four inches long.—Open, rocky slopes, as on Punchbowl and along shore road at Diamond Head.

Leaves.—Pale, linear, flat, 4-10 inches by 1/6 inch, mostly folded, smooth, rough above and on margins; sheath smooth, flatly keeled; ligule short haired. *Flowers*.—Spike single, extending beyond leaves, 1-3 inches long, excluding awns, somewhat hooked, 1-sided, green or tawny, awns brown; rhachis slender, continuous, smooth in lower third or half, which is male or neuter, articulate and hairy; spikelets in pairs, 1-flowered; male or neuter spikelets flat, lanceolate, overlapping in 2 rows, awnless; female spikelets almost concealed by male, slender cylinder bearing awn about 4 inches long with 2 bends. *Stamens*.—Three. *Pistil*.—Styles 2 or 3, distinct; stigmas long and thick. *Fruit*.—Grain enclosed in outer glumes. *Home*.—Tropics.

Japanese grass, Mascarene grass, velvet grass (*Zoysia tenuifolia* Willdenow).—A small creeping grass with a long stiff rootstock bearing branches covered with fine awl-shaped leaves, the Japanese grass, forms a beautiful thick though bumpy turf. It grows fast and eventually produces such close mats that other plants, even other grasses, are smothered by it. It needs little water and no cutting and will grow in cool countries, for if frozen it will sprout again. This grass is cultivated in many warm places, as Guam, California, Hawaii, and is a favorite in Japan.—Courts at the Academy of Arts.

Leaves.—Arranged in 2 vertical rows, awl shaped, concave, very fine. *Flowers*.—Spikelets ovoid, flattened laterally, one-flowered, jointed on short thick stems, appressed to a rigid rhachis; glumes 2, one empty, leathery, margins appressed, tip membranous, no veins, the other smaller and enclosed in the first, ovate-lanceolate, one-veined, hyaline, palea linear-oblong. *Stamens*.—Three; anthers long. *Pistil*.—Styles very long, joined below, stigmas plumose, exerted at top of spikelet. *Fruit*.—Grain oblong, free within glume and palea. *Home*.—Mascarene Islands.

Hilo grass (*Paspalum conjugatum* Bergius). Figure 4, f.—According to the botanist, Hillebrand, Hilo grass was first seen about 1840 in Hawaii at Hilo. It spread rapidly there, and when it replaced other grasses in pastures it became a pest, as stock would not eat it. In forested regions the grass is also a pest, as it is causing the extinction of some native forests. Hilo grass is found in many tropical countries. It is sturdy and coarse and creeps extensively over the ground, its erect branches growing as tall as two feet. High above the leaves, which are short and rough edged, rise tiny flowers, packed evenly in two rows on a slender part of spikes.—On roadsides, in waste places, below forests.

Leaves.—Thin, papery, some, 7-8 inches by 1/2 inch or less, rough at margins, smooth except for hairs at base, sheath flattened, smooth, ligule hairy. *Flowers*.—Spikes 2, paired, joined at base, stemless, each 2-3 inches long, slender, spreading, hairy at base; rachis narrow, spikelets 1-flowered, short stemmed, small, broadly ovate or ovate-oblong pointed, loosely overlapping in 2 rows, yellow, hairy on margins. *Stem*.—Three. *Seed*.—Ovary smooth, styles long and stigmatic above. *Fruit*.—Grain enclosed in outer glumes. *Home*.—Tropics (Kew Index); Toward America (Hillebrand).

Paspalum (*Paspalum dilatatum* Poirer). Figure 4, g.—A tall Brazilian grass, one of the paspalums, supplies good pasturage for cattle and horses in Hawaii, growing to an elevation of 6000 feet. It forms tufts as tall as four feet, and unlike its relative, the Hilo grass, it does not creep. Its blades are smooth except at the base, where they are hairy. The flowers are in four to six spikes, which rise alternately on the flowering stem, and they overlap in two to four even rows. The leaves are slightly narrower than those of the Hilo grass. On roadsides and in fields near Honolulu this grass is common.

Guinea grass (*Panicum maximum* Jacquin).—Guinea grass, brought to Hawaii unintentionally with other plants many years ago, is now as common as a weed in many places. It is a useful grass, furnishing fodder to stock. It is tall and sturdy, growing three to six feet high in tufts, without creeping stems. The nodes are bristly. The blades are wide and long and at the base are hairy. The large, tasseled flower head bears many tiny flowers.—Open places near the road.



FIGURE 4.—Grass family: a, chaetochloa (*Chaetochloa palmifolia*), leaf and flowering head; b, Job's tears (*Coix lacryma-jobi*), leaves and male and female flowers; c, Bermuda grass (*Cynodon dactylon*); d, sand-bur (*Cenchrus echinatus*); e, paspalum (*Paspalum dilatatum*), f, Hilo grass (*Paspalum conjugatum*); g, buffalo grass (*Stenotaphrum secundatum*).

Leaves.—Lanceolate, contracted at base, not plaited; blade erect or ascending, flat, 12-30 inches long, up to $1\frac{1}{3}$ inches wide, margin rough, surfaces smooth or hairy above near base; sheath hairy to smooth, collar ordinarily downy; ligule up to $\frac{1}{4}$ inch long, densely hairy. *Flowers*.—In a dense cluster 8-20 inches by $\frac{1}{3}$ inch, branches long, stiff, ascending, bare at base, the lower in whorls, axils hairy, branchlets short and bearing clustered, short-stemmed spikelets; spikelets about $\frac{1}{10}$ inch long, smooth, oblong-ellipsoid, first glume about $\frac{1}{3}$ as long as spikelet, second glume and stamen-bearing lemma smaller, 1 fertile flower. *Stamens*.—Three. *Pistil*.—Styles elongate terminal; stigmas pencil shaped and with toothed hairs. *Fruit*.—About $\frac{1}{10}$ inch long, wrinkled transversely. *Home*.—India (Hillebrand); Tropics (Kew Index).

Redtop, Natal grass (*Tricholacna rosea* Nees).—A grass commonly seen by roads and in fields in and near Honolulu is the redtop, a good grass for forage. It thrives in dry places in loose or sandy soil. Its long, narrow leaves are not a distinctive feature; but its beautiful, red, feathery flowering heads are. These bend like small plumes in the breeze and shine in the sunlight.—Above Makiki Cemetery on Wilder Avenue; head of Magazine Street.

Leaves.—Blades flat, 2-4 inches by at most $\frac{1}{5}$ inch, smooth or hairy about base; sheaths smooth or lowest with flat-lying hairs, downy on collar; ligule densely hairy, minute; rising from a prostrate base on stems up to 3 feet tall. *Flowers*.—Panicle open, oval, purplish or yellowish, $2\frac{3}{4}$ to $5\frac{1}{2}$ inches long, very silky-hairy; branches slender, rough; pedicels threadlike, flexuous, bearing spikelets $\frac{1}{10}$ inch long with silky hairs up to $\frac{1}{10}$ inch long; first glume small, shorter than spikelet, hairy; second glume and sterile lemma equal, raised above first glume, notched or lobed, short awned, covered except toward tip with long, violet, silky hairs. *Fruit*.—In silky-hairy panicles, lemma shorter than spikelet, cartilaginous, boat shaped, margins thin, not inrolled, enclosing margins of palea. *Home*.—South Africa?

Sand-bur, bur-grass, sand-spur, hedgehog grass (*Cenchrus echinatus* Linnaeus). Figure 4, d.—In Honolulu it is not difficult to gain the acquaintance of the sand-bur, and often a short walk across a lawn will make a person quite familiar with it. For its round, spiny burs, which are arranged on narrow spikes, when ripe readily attach themselves to passing objects, and the spines can even pass through shoe leather. This plant is a common field grass. Its base lies on the ground, bends at an angle, and has an upright, much branched stem one to two feet high. Long, narrow leaves clothe it to the top. In tropical America, Asia, and Africa the sand-bur is common. First noticed in Honolulu in 1867 it has developed into a serious pest, furnishing little pasturage before burs form, none afterwards. Besides this species two other species are common in Hawaii.—On roadsides.

Leaves.—Flat, 2-5 inches long, about $\frac{1}{4}$ inch broad, smooth, margins scabrous, some involute with keel along midrib; leaf sheath smooth or hairy; ligule hairy. *Flowers*.—Spike 3-4 inches long, 8-20 clusters of greenish flowers, each cluster subtended by ovoid or round involucre—the burs; spikelets 3-6 in each bur, ovoid, $\frac{1}{4}$ inch long, smooth, 1-flowered or with neuter or male floret below fertile 1; fertile glume papery, 5-veined, palea 2-veined. *Fruit*.—Round, spiny burs, rather loosely arranged, about $\frac{1}{5}$ inch wide, base downy, subsessile, split to near base into 8-10 acute bristly lobes. *Home*.—Tropics of both hemispheres.

Buffalo grass, St. Augustine grass, manienie maoli [*Stenotaphrum secundatum* (Walter) Kuntze]. Figure 4, *g*.—In the open, in the shade where other grasses cannot grow, and on many kinds of soil the adaptable buffalo grass will grow in warm climates, and it is therefore a valuable lawn grass for warm countries. It is also used for fodder. Bermuda and buffalo grass are the chief if not the only kinds used for lawns in Honolulu, except rarely the Japanese grass. The buffalo grass grows from sea level to an elevation of about 2,000 feet and needs less moisture than the Bermuda grass. It has long, smooth, creeping stems that root at the nodes, long internodes, and short leafy branches, which seldom require mowing. Many flowers are embedded in notches on single spikes.—On lawns.

Leaves.—Broad, not exceeding 6 inches in height, flat, divergent at right angles, in 2 vertical rows, 4-8 pairs, pale-powdery, nearly opposite; blades short, obtuse, about $\frac{1}{4}$ inch wide; uppermost shorter than sheaths, plane or plated, edges smooth; sheaths overlapping except in uppermost nodes of fertile branches, open to base, compressed with sharp keel. *Flowers*.—Racemes terminal and axillary, 2-4 inches long; spikelets embedded in alternate notches of an enlarged and flattened corky rhachis, 2-flowered, lower male or neutral, 2-4 in short spike. *Stamens*.—Three; anthers yellow, linear. *Pistil*.—Styles 2, protruding. *Fruit*.—In notches in rhachis. *Home*.—Tropical shores of both hemispheres.

Rice, paddy (*Oryza sativa* Linnaeus).—Since 1856 rice has been raised in Hawaii, chiefly on the northern side of Oahu and Kauai. It is also cultivated in the West Indies, South America, southern Europe, and on the coast of southern United States, but nowhere so extensively as in China and India, where it is not only an export but from time immemorial has been the staff of life of the native population. It supplies more food to human beings than any other kind of plant, and it is high in carbohydrates, containing 78 per cent. In India about seventy million acres are cultivated, the yield per acre ranging from 12 to 80 bushels. In Spain the average yield is large, 101 bushels per acre. Many varieties exist, in Ceylon alone 500. Be-

sides its use as food, rice is made into a fermented liquor, saki in Japan, where it is usually served hot, being the chief alcoholic drink.

The plant is grown in marshes, and its stems, clothed with grass-like leaves, ascend two to five feet. The seeds are planted thickly, and when the seedlings are eight to ten inches high they are transplanted, two to four being placed together in holes about 6 inches apart. Many paddy fields are terraced, and the irrigation water flows down from one field to another. They are kept flooded until the rice flowers appear, when the supply of water is reduced. As soon as the grain has developed the water is turned off to hasten harvest time, which comes at the end of three to seven months. Water buffaloes or machinery are used for threshing.—Near Moanalua Gardens.

So-called "rice paper" is a misnomer, as such paper is made from bamboo or mulberry and not from rice.

There is a wealth of Oriental legend concerning rice. One tells of a time when in the land of Laos, in Indo-China, the ripe rice would wheel itself into the granaries. A greedy old woman complained because the rice did not wait until she was ready with a larger granary. The rice broke into a thousand pieces and cried, "We shall never come again. We shall stay in the fields and you must come and fetch us." And to this day man has to work hard to raise and harvest the tiny grains of rice.

A Javanese myth tells of a masculine Pandora. He had captured a winged maid from heaven, hid her wings, and married her. She went to the river to wash clothes and bade her husband not to lift the lid of the rice kettle. He was curious to know how she could provide so many meals from one measure of rice and he lifted the lid and saw but one grain. When the wife returned she saw the single grain and knew that through her husband's curiosity her miraculous power of producing food was gone. Weary of the work of preparing food, she at last found her wings and went back to heaven.

Leaves.—Green, long, very rough; ligule scarious, thin, not green. *Flowers*.—In narrow, erect panicles, 6-12 inches long; spikelets 1-flowered, 1/4 inch long, oval-oblong, flat, articulate, on short stems along the bending branches of a terminal panicle; 2 empty, small glumes on each side of a flowering one, which is conspicuously 5-veined, hairy keeled, embracing a 3-veined palea. *Stamens*.—Six. *Pistil*.—Style short, distinct. *Fruit*.—Grain enclosed in hardened glume and palea. *Home*.—Tropical Asia.



PLATE VII. CYPRESS (*CUPRESSUS SEMPERVIRENS*) AT RIGHT,
ARECA (*CHRYALIDOCARPUS LUTESCENS*) AT LEFT.



A



B

PLATE VIII. A, SUGAR CANE (*SACCHARUM OFFICINARUM*), PHOTO-
GRAPH BY R. J. BAKER; B, PAMPAS GRASS
(*CORTADERIA ARGENTEA*).

Bermuda grass, manienie haole (*Cynodon dactylon* Persoon). Figure 4, *c*.—On lawns, in gardens, and bordering streets in Honolulu, as well as at low elevations in many warm countries the world over, the Bermuda grass is a common covering. It spreads rapidly over the ground, rooting at the joints of creeping stems, from which arise flat leaf-bearing stems. The tiny flowers grow on finger-like branches extending from the top of a stalk.—On lawns.

Leaves.—Blades short; ligule a conspicuous ring of white hairs. *Flowers*.—Spikes 4 or 5, 1-2 inches long, finger-like at top of upright flowering stems; spikelets overlapping, about 1/12 inch long, 1-flowered, awnless, sessile in 2 rows on 1 side of a slender rhachis; glumes shorter than floret, which is flat and downy on keel. *Home*.—Cosmopolitan (Kew Index).

Chloris (*Chloris paraguayensis*). See page 305.

Pampas grass (*Cortaderia argentea* Stapf). Plate VIII, *B*.—The pampas grass belies its name, for in South America, its home, it does not grow on the pampas or grassy plains but in the mountains, where it receives a moderate and fairly constant supply of moisture. This grass is considered one of the finest of the tall, plummy kinds, and in California is grown commercially and shipped to Europe, its plumes sometimes being dyed different colors. It grows in large, thick tussocks with leaves crowded around the base, from which flower stems rise a yard or two high and support beautiful silvery-white plumes two to three feet long. This grass is grown ornamentally in clumps on lawns and is very attractive when bearing its feathery flowers, which last long. In some countries plants should be renewed every two years. The flowers of the female plants are superior to those of the male or pollen bearing. Varieties have plumes of different colors: rose, carmine, violet, purple.—2426 Oahu Avenue; 2487 East Manoa Road.

Leaves.—In large, thick tussocks, mostly crowded at base, rising from a short rhizome, long, narrow. *Flowers*.—Biennial; on stems 3-6 feet high excluding panicle, which is 2-3 feet long; spikelets 3-6 flowered, uppermost flowers more or less rudimentary; silvery-white, varieties shades of red and purple. *Home*.—South America.

Giant reed (*Arundo donax* Linnaeus). Plates XI, *B*; XIII.—The giant reed is a rapidly growing grass known in many warm countries. In Mexico it lives along rivers and ditches, in Honolulu decoratively on lawns. As it is evergreen and eight feet high or more, it serves well as a screen. In some countries the long stems are used for arrows, flutes, fishing rods, laths, thatching, woven

work. Leaves are regularly spaced on the sparingly branched stems, from base to near the top, and they are long, broad, rough edged, and gracefully arching. In immense, slightly drooping plumes, a foot or two long, at the top of the stems, grow the flowers, which are a showy red at first and last for a long time—2525 Jones Street; Sugar Planters' Experiment Station, Keeaumoku Street.

A variety (*variegata*) is smaller, four feet high or more, and has leaves striped longitudinally green and creamy-white.

Another variety (*macrophylla*) has large, very smooth leaves.

The Egyptians believed that the soul had to pass seven god-guarded halls before it could be received by Osiris, who dwelt in the Field of Reeds. Greek legend tells of Syrinx, who was so persistently wooed by Pan that she fled to a river bank and called on the nymphs to rescue her. Just as Pan was about to throw his arms about her, she was changed into a reed. He sighed and the plaintive music through the reeds so pleased him that he made a pipe from them and exclaimed, "Thus, at least, you shall be mine."

Leaves.—Broad, pointed, regularly spaced, arching; long, rough margined, flat blades. *Flowers*.—In dense, slightly drooping panicles 1-2 feet long, red at first, lasting long; spikelets $\frac{1}{3}$ inch long, pointed. *Home*.—Mediterranean region and Orient.

Bamboo, ohe (*Bambusa vulgaris* Schrader and Wendland).—Probably since early in the nineteenth century the common bamboo has been growing in Hawaii, where it is now found in both wild and cultivated states. Outside of Honolulu dense forests, which spread by means of underground stems, grow in low valleys, at the foot of cliffs, and on mountain sides to an elevation of 2,000 feet. This slender tree is ordinarily between 20 and 40 feet high, and its polished, hard, green stem is ringed at regular distances with slightly raised, hairy nodes. The internodes are about a foot long, woody, and hollow. In some tropical countries the stems are used extensively in construction, in Hawaii for fishing poles and canoe outriggers only. The foliage is not heavy, though the rough, pale-green leaves are borne on many branches, and as a result dense and nearly impenetrable forests are not darkly shaded. A variety of this bamboo with striped green and yellow stems is planted for ornamental purposes in Honolulu.—Beside Pleasanton hotel; Castle Kindergarten, King Street near Alapai Street.

Formerly in Hawaii one kind of bamboo, which was probably brought here many centuries ago, was made into knives for everyday use and for sacred ceremonies. It grows wild in the mountains as tall as 40 feet.

Hina was said to have brought it from Kahiki and planted it beside her door. When her grandson, Maui, saw the plant he reached for it, and his hand was cut by the bamboo, which then had a sharp cutting edge. When his grandmother saw the wound she turned the cutting edge inward and made the bamboo smooth and round as it is today. When Laukia wanted to find her father she sat upon a bamboo stalk and it grew and grew and finally bent over and set her down in the far place where her father was. In a Santal tale bamboo grew from the grave of a murdered girl, and it was made into a flute of wondrous sweetness.

A Philippine myth tells of a bird pecking open two joints of bamboo that floated on the waters after a deluge. Out of one joint stepped the Eve of the world, out of the other came Adam. An origin myth of the Hopi Indians states that the lowest of the four worlds was so crowded that two gods descended and planted vegetation in the hope that something might grow high enough to permit the unhappy people to escape. At last the bamboo grew so tall that man could climb to the higher world on the ladder-like joints.

It is not strange that the Orient has much lore concerning bamboo. An Oriental Robinson Crusoe could supply himself with food, make himself a house, fences, cooking utensils, clothes, and even musical instruments if he were cast away on an island where bamboo grew.

According to Chinese legend bamboo shoots did not grow in the winter in the old days. One winter the mother of Mang Tsung was ill and she longed for a soup made of bamboo shoots. Her son went into the bamboo forest and wept. His filial love so moved heaven and earth that at his feet bamboo sprouts sprang from the earth. His mother recovered, and since that time bamboo sprouts in the winter.

The Chinese believe that bamboo is a charm against evil spirits. In Japan it is a symbol of straightforwardness. "A single bamboo does not make a raft," is a Chinese proverb. "A calabash and a cover, a calabash and a cover," is a Hawaiian riddle whose answer is bamboo.

Leaves.—Pale-green, 6-12 by 1/2-2 inches, pointed at tip and rounded at base, rough on or near margins and beneath, young leaves hairy beneath, veins 6-8 with 8-9 intermediates. *Flowers*.—Rare, in spikelets in a very compound panicle, about 1/2 inch long, yellow, 6-8 together, lower ones fertile and with longer bracts than upper infertile ones. *Stamens*.—Six, with long purple anthers. *Pistil*.—Style long, downy, stigmas 3, feathery. *Home*.—India.

Chaetochloa [*Chaetochloa palmifolia* (Willdenow) Hitchcock and Chase]. Figure 4, *a*.—A conspicuous grass used rather commonly in Honolulu for ornament and also found wild on damp ground in woods or in the open is a chaetochloa. The leaf blades are long and wide and plaited, resembling a young palm plant, and they rise from the ground on erect stems that may become nearly two feet high. Few or many flat-lying bristles grow at the joints and below them.—Beside Tantalus road above Makiki Heights; cultivated in some gardens.

Another chaetochloa, bristly foxtail (*C. verticellata*), has much shorter and narrower leaves. It is a common pest, known for barbed seeds that cling not only to clothing but also to wool, fur, and hair of animals.

Leaves.—Blades plaited, strongly veined, narrowly elliptical, as much as 20 by 3 1/2 inches, pointed, scabrous above, downy beneath, narrowed almost to a petiole; sheaths covered with minute bumps and more or less bristly. *Flowers*.—In panicle as much as 23 inches long, consisting of many spreading scabrous branches 8 inches long; spikelets on short, appressed branchlets, lanceolate, green, smooth, about 1/7 inch long, on minute scabrous pedicels; 1st glume broad and ovate, obtuse, 3-veined, about 1/3 as long as spikelet, 2d glume shorter than fruit, 7-veined; branchlets bearing scattered slender flexuous bristles about 2/5 inch long. *Fruit*.—Panicle ordinarily loose and open; fruit lanceolate, bearing a few bristles below part of spikelets. *Home*.—Originally described from India.

SEDGE FAMILY

(Cyperaceae)

Sedge (*Cyperus*, several species).—On slender, triangular, unbranched stems, with grasslike leaves only at the base and at the summit, where they spread out umbrella-like with tiny flowers clustered at their joining, sedges grow in gracefully nodding clusters. They prefer damp ground, as in or near pools, and with proper treatment will also thrive in pots. Several clusters are growing at Fernhurst. Some kinds of sedges are pests when spreading amongst

crops, one kind is that from which the famous Niihau mats were made; and another, the tall *Cyperus papyrus*, grown here and there in Honolulu, furnished paper to the ancient Egyptians.

Nut grass (*Cyperus rotundus* Linnaeus).—A common garden weed that has become one of the most detested weeds in Hawaii since its introduction about 1850 is a sedge called “nut grass.” This name is due to the presence on its creeping underground stem of small nutlike tubers and to the grasslike appearance of the plant. The tubers have a sharp taste, and in Ceylon a perfume is obtained from them. Medicinally they are said to be astringent and diuretic. The leaves are flat, narrow, and pointed and are situated at the base of triangular stems half a foot long or more, from the top of which radiate four to six flowering branches. The plant is known in warm countries all over the world, in the United States as far north as Virginia. It is prolific and persistent.—On lawns.

Tubers.—Size of a pea to 1 inch in diameter, descend a foot or more, stored with plant food. *Leaves*.—Flat, flaccid, about $\frac{1}{6}$ inch broad, acute, upright, somewhat scabrous near apex, forming a rosette at base of plant and having 1-4 leaves at summit forming an involucre not exceeding the umbel. *Flowers*.—Umbel simple, of 4-6 slender rays, the longest 1-2 inches, each bearing in its upper third or fourth 4-9 ascending spikelets, which are sessile, linear, moderately compressed, nearly 1 inch long 12-35 flowered with 1-2 empty glumes at base; glumes 2-ranked, ovate, nearly $\frac{1}{6}$ inch long, overlapping, dark-brown or reddish except at greenish 3-veined keel. *Stamens*.—Three. *Pistil*.—Style 3-fid, long-exserted. *Fruit*.—Nut obovate, triangular, dotted, shorter than glume. *Home*.—Cosmopolitan.

PALM FAMILY

(Palmaceae)

Date palm (*Phoenix dactylifera* Linnaeus). Plates V; IX.—Next to the coconut palm the date palm is perhaps the most useful tree. No more definite location for its home is known than some part of the Old World, perhaps somewhere between the Euphrates and the Canary Islands. It has long been cultivated in Asia, Africa, Europe, and is a boon to humanity in desert oases, where it grows best, and is the chief food of many people in Egypt, Arabia, and Persia. It will grow in salty soil, also, but not near the sea. One town in Spain is surrounded by a forest of 80,000 date palms.

The tree grows slowly to a height of 40 feet or much higher and

may live for about 200 years. Its trunk bristles with the stubs of old leaf stems and bears at its top a globular head of long, gray leaves with many leaflets, which stop only near the base of the stem. Each season, some beginning in March, several bunches of yellow flowers appear at the leaf axils. After pollen has been applied artificially, fruit develops in abundance, about 200 dates on each flower cluster four or five months after flowering. The number is less at advanced ages of the trees. Different varieties of date palms have different shape, color, and size of fruit—round or oblong, one to two inches long, yellow to brown. In Honolulu, date palms are used ornamentally only, especially for avenues. If an effort were made to pollinate the fruit artificially, it is said that good results would possibly be obtained. Besides the yield of valuable fruit crops, this tree has leaves that are used for mats, huts, and for decoration, the fiber of the stems for cordage, the sap for sugar or wine, the unopened flower bunches for cabbage, the seeds for food for camels and cattle, the wood for houses.—Grounds of Queen's Hospital; Fernhurst.

Mahomet said to the Arabs, "Honor the date palm, for it is your mother." The Orient has a Rip Van Winkle story of a magician who, in searching for magic fungus, came upon two old chess players. He watched them until he became hungry and was given a date stone, which appeased his hunger. At last one man said, "Go home. You have been here a long time." The magician found that he had been watching the old men for hundreds of years. The food they had given him was the "date stone of forgetfulness."

Christian legend tells of a date palm which bent down that the Virgin might pluck its fruit. The infant Christ rewarded it by giving it a place in paradise. The staff of St. Christopher was said to be a date palm. After he had carried the Holy Child across the swollen stream, he was told to plant his staff, and lo, it immediately blossomed and bore fruit.

In Christendom the palm is a symbol of martyrdom or of victory. A palm branch was carried before Jesus when he rode into Jerusalem, and in Revelations the multitude are pictured as carrying palm leaves in their hands. The pilasters of Solomon's temple were in the form of palm trees. The palm, cypress, and olive are emblems of the Virgin. The cross is said to have been made of palm, cypress, cedar, and olive, to denote the four corners of the globe.



PLATE IX. DATE PALMS (*PHOENIX DACTYLIFERA*).



A



B

PLATE X. A, CANARY ISLAND DATE PALMS (*PHOENIX CANARIENSIS*); B, COHUNE NUT PALM (*ATTALEA COHUNE*), QUEENSLAND KAURI CLOSE BEHIND AT LEFT.

Leaves.—Many massed at top of trunk, arcuate-ascending, long, gray, pinnate; leaflets linear-lanceolate, pointed, upper 2-ranked, lower 4-ranked and some spinelike, strongly folded longitudinally; sheaths short, fibrous. *Flowers*.—Spathes at leaf base, entire, long, compressed, 2-edged, leathery, dividing dorsally and ventrally; spadices many, more or less erect, peduncle compressed, flowers in yellow clusters, sexes on separate trees. *Fruit*.—In large clusters, round or oblong, 1-2 inches long, orange or yellow-brown, edible, sweet; seed oblong, grooved on 1 side. *Home*.—Old World (Standley); northern Africa and Arabia (Kew Index).

Wild date palm, date-sugar palm (*Phoenix sylvestris* Roxburgh.)—Another date palm, this one coming from India, is much like its more cosmopolitan relative, the date palm. But it is more attractive, grows faster (25 feet in 12 years), and does not exceed 50 feet in height. The sap of this tree is used extensively as a source of sucrose, many thousand tons of which are produced yearly in Bengal. Each tree yields eight pounds of sugar annually, and it can be tapped for its sweet sap for 50 years. In Honolulu it is hybridized by insects with the date palm so extensively that, it is said, the two species cannot be distinguished.

Canary Island date palm (*Phoenix canariensis* Hortorum). Plate X, A.—The Canary Island date palm is one of the most majestic palms cultivated. Even though it has a very large trunk, it is considered more attractive than the date palm, which it resembles. It grows comparatively fast, one young tree being four feet high, three feet in diameter, with 100 leaves and eight bunches of fruit weighing about 80 pounds at 10 years of age. When 15 years old, the palm is symmetrical and beautiful. The leaves are dark-green, glossy, long. They are narrower than those of the date palm and more numerous. With *Phoenix sylvestris* this palm forms hybrids. In Honolulu it is rare.—Corner of Vancouver Highway and Oahu Avenue.

Leaves.—Dark-green and narrower than those of date palm, 12-20 feet long, glossy, about 200 in crown; leaflets 150-200, paired; stem thick and swollen at base, short, armed with strong, long spines. *Flowers*.—Similar to those of the date palm. *Fruit*.—Ovate-elliptical or oblong, ends rounded. *Home*.—Canary Islands.

Fortune's palm, chusan palm, small Chinese fan palm (*Trachycarpus excelsus* H. Wendland).—Fortune's palm is one of the hardiest palms, even growing outdoors all the year in southern England. For best growth, a cold winter is required, and consequently it does

not prosper in Honolulu, where, however, a few are growing. Besides, it is said that palms with pinnate leaves—divided like a feather on a long axis—are more popular than fan-leaved palms, like this one. Fortune's palm grows slowly, reaching a height of 30 feet, and while its handsome leaves somewhat resemble those of the Chinese fan palm, they do not equal them in beauty. Chinese laborers make hats from the leaves and a garment worn in rainy weather. The black fiber surrounding the base of the leaf stalks is also used by the Chinese for domestic purposes, for ropes on junks, and for bed bottoms. In their season, small clusters of tiny yellow flowers form and later develop into kidney-shaped fruits.—Park at corner of King and Keeaumoku streets; Queen's Hospital.

Leaves.—Fan shaped, dark-green, somewhat stiff, tough; blade cut about half way down into many segments $\frac{3}{4}$ -1 inch broad and pendulous at tips; stems 1 $\frac{1}{2}$ feet long or more, convex below and nearly plain above, margin slightly toothed if at all, base surrounded by black fiber. *Flowers*.—Spathes leathery, compressed, downy; spadices many, stout, branched, small; flowers small, 2-4 on a tubercle, polygamo-monoecious. *Fruit*.—Kidney-shaped drupe, 1-3 together, deeply hollowed on 1 side. *Home*.—Japan, China, upper Burma.

Bamboo palm (*Rhapis flabelliformis* Aiton). Plates XI, A; XIV.—The graceful, slender bamboo palms, which reach a height of five to twelve feet, grow in bushy clumps of straight, reedy trunks crowned with about eight shining dark-green leaves. In pots in the house this very decorative palm is popularly used. In Honolulu are several clumps outdoors, multiplying by producing suckers at the base. The leaves are split to the bottom of the semicircular blade five to seven times. At the base of the slender leaf stalks is a matted network of fibers. Good walking sticks are made from this palm, which is also called "rattan palm."—Fernhurst; 2326 Oahu Avenue.

Leaves.—Alternate, rather thin, shining, dark-green, palmate; segments 5-7, split down to base, subplicate, ciliate, spinulose along margins and mid-veins, semicircular, irregular notched at apex; stems slender, biconvex, 1 $\frac{1}{2}$ -4 feet, serrulate along margins, at base matted network of fibers. *Flowers*.—Spathes 2-3, thin, incomplete; spadices shorter than leaves, slender stemmed, bearing yellow flowers; sexes on separate trees. *Fruit*.—Berries with soft endocarp. *Home*.—China and Japan.

Cuban palm, silver thatch palm, silver-leaved palmetto, broom palm [*Coccothrinax argentea* (Loddiges) Sargent].—Of rather elegant form is the West Indian silver thatch palm, which is fairly common in Honolulu. It grows slowly 12 to 40 feet high and 2 inches or

more thick, and it grows easily, needing little care, though protection from wind is advisable in order to keep the leaves whole. Several silver-backed, round leaves, with folds like a fan, cluster at the end of the trunk on slender stems, which are longer than the leaf blade. The leaves are divided part way down into segments, which are forked at the tip. In the West Indies they are made into baskets, hats, etc., in Panama into brooms. Flowers hang in long clusters on slender stems and develop into massed clusters of berry-like fruits the size of peas.—Capitol grounds.

Leaves.—Fan shaped, silvery beneath, rather fragile; divided into about 60 segments to a little below the middle, deeper in young plants, 3 1/3 feet by 1 1/2 inches to 0 at tip, bifid; stem longer than blade, slender, biconvex, margins smooth. *Flowers.*—Greenish or yellowish, spadices shorter than leaves; perianth low-cupular, divided to base into 6 narrow teeth; stamens ordinarily 9. *Fruit.*—Dark-blue, round, hanging on branching stalks in thick clusters closely around top of trunk; fruit 1-seeded, each nearly 1/2 inch long. *Home.*—West Indies.

Chinese fan palm (*Livistona chinensis* Von Martius). Plate XVII, B.—On many lawns in Honolulu the decorative Chinese fan palm is growing, and it is cultivated in many other countries. On the mountain slopes of an islet belonging to Japan—Kyushu—the government is preserving a whole forest of the palm, and this is its northern limit. The stem or trunk, gray and ringed with shallow leaf scars and reaching a height of six feet and a diameter of one foot, bears on its summit a large, round cluster of bright-green leaves—giant fans. Each leaf is divided into about 50 long, narrow segments, which are deeply forked, the tips hanging vertically. The stems are spiny, and around their base is a network of fibers, from which rope is made. Fans are made from the leaves. Flowers grow in white bunches, and some time after they fall the fruit ripens, hanging around the top of the trunk in yellowish bunches.—Beside Bishop Museum.

Leaves.—Many, bright-green, fan-shaped; blade kidney shaped, 4-6 feet in diameter, segments about 50 linear-lanceolate, hanging, deeply forked, 1-2 feet by 1-2 inches; stem 6 feet by 6 inches, covered to about middle with retrorse, brown spines about 1 inch long, many fibers at base. *Flowers.*—White, in bunches growing from leaf axils, small, unpleasant smelling, mostly 4 together, spathes bifid, spadix branching and spreading. *Fruit.*—Elliptical, about 1 inch long, bluish-green bloom on orange-yellow flesh, ordinarily 1 on a stem ripens, rarely 2-3. *Home.*—China.

Fan palm (*Livistona rotundifolia* Von Martius). Plate XII, A.—A close relative of the Chinese fan palm is much less common in Honolulu. It is an elegant tree, and the trunk grows 40 to 60 feet high and about a foot thick. Outside it is brownish-black and ringed with leaf scars; inside it contains an edible starch that serves as flour. The leaves are similar to those of the Chinese fan palm; but the segments are united in the lower third, and each one is forked to the middle. From the many greenish flowers develop round, smooth, berry-like fruits, orange in color.—1445 Keeaumoku Street; corner of Pensacola Street and Wilder Avenue.

Leaves.—Many, forming a spreading, round crown; blade fan shaped, 3-5 feet in diameter, indented at base; segments 60-90, each 1-2 inches wide and bifid to middle, united in lower third, long-acuminate; stems 6 feet long, in lower part with teeth 1 1/2 inches long. *Flowers*.—Spathes many, long, tubular, flat, thick; spadices 3-5 feet long, hanging from between leaves on reddish, long-stemmed, loose, slender branches; flowers many, small, greenish or yellow, 3-4 together, hermaphrodite. *Fruit*.—Round, orange with blue skin, about 1/2 inch in diameter, smooth, shining, berry-like. *Home*.—Java.

Blue palm (*Erythea armata* Watson).—A very beautiful palm is the blue palm from Lower California. At home it lives along dry stream beds in canyons and grows 18 feet high or twice as high and has a diameter of 2 feet at the base. Above, where the dead leaves hang around the trunk, it seems much larger. It is rare in Honolulu. The nearly round or fan-shaped leaves are numerous. They are cut deeply into narrow segments, which bear some filaments, and are covered with a whitish bloom that gives them a bluish cast. On the lower part of long slender stems, which follow the leaves outwards, hanging below them towards the ground, is borne an attractive white or purplish inflorescence. The fruit that forms is an added decoration, many small, round fruits clustering closely around the lower part of the stem.—Kapiolani Park; 56 Wyllie Street.

Leaves.—Fan shaped, many, stiff, covered with whitish bloom, young leaves woolly; segments 30-40, slightly filiferous, narrow, deeply cut, rachis short; stem nearly 4 feet long, deeply channeled, edged with irregular flattened spines somewhat hooked. *Flowers*.—Spathes many, sheath peduncle leathery, woolly; spadices about 6 feet long, white, matted with hairs, branches stout; flowers white to purplish at end of long branches. *Fruit*.—Small, round, many clustered closely from tip of stem to near the middle. *Home*.—Lower California.

Fiji fan palm, viu (*Pritchardia pacifica* Seemann and Wendland).—A handsome palm and perhaps the best-looking pritchardia is a fan palm from the south Pacific. In the 'seventies it was brought to

Honolulu, where several are now growing well. Most of these palms raise their smooth, straight trunks, which are about a foot in diameter at the base, to a height of less than 30 feet. They are crowned with a round cluster of about 20 leaves, which are wedge shaped, like a third of a circle. The oldest and lowest leaves spread horizontally, the rest at greater or less ascending angles. Their stems are singularly fibrous and fluffy and at the base are covered with a mass of brown fiber. Formerly in Fiji only chiefs were allowed to use fans made from these leaves. The fans were two to three feet across and were used as protection from both rain and sun. In axils of upper leaves the flowers bloom, and develop into tiny, round, black fruits.—1725 Kewalo Street; 622 Judd Street.

Leaves.—About 20 in the crown, wedge shaped, 4 1/2 by 3 1/2 feet, smooth, young leaves covered with whitish-brown wool; segments about 90, cut about 1/3 of the way down; stem 3 1/3 feet long, fibrous, fluffy, base surrounded by a mass of brown fiber. *Flowers*.—In axils of upper leaves; spathes fibrous, flaccid; spadix 3 feet long, straight, stiff; flowers many, hermaphrodite, brownish-yellow; corolla a persistent tube with deciduous segments. *Fruit*.—Round, 1/2 inch in diameter, black, slightly astringent in taste. *Home*.—Fiji, Tonga, Samoa.

Pritchardia (*Pritchardia thurstoni* F. von Mueller and Drude).—Another non-Hawaiian pritchardia, also from Fiji, is growing in Honolulu, for example, on the grounds of the University of Hawaii, in front of Hawaii Hall. It can be distinguished from the Fiji fan palm by smaller dimensions of trunk, flowers, and fruit, and by its long, slender flower stalks, which extend like fishing rods and exceed the leaves. The inflorescence resembles a double cone in shape. Each of the round fruits is a quarter of an inch in diameter and contains a seed about half as large.

Pritchardia, loulou palm, fan palm (*Pritchardia martii* H. Wendland).—A Hawaiian pritchardia, at most 15 feet high and a foot thick, is used ornamentally here and there in Honolulu. All the 31 known kinds of this palm are natives of Pacific islands, except one in Cuba, and most are from Hawaii, where they grow wild in the mountains. They are also the only palms native to Hawaii. From W. T. Pritchard, one-time British consul in Fiji, their name comes. The rigid leaves, wedge shaped in outline and divided into many segments, are borne on long stems. In clusters a yard long flowers appear, later, greenish, small, elliptical fruits, which contain within a substantial covering a single nut. The new leaves were

sometimes used in thatching native houses.—Grounds of Capitol and Judiciary buildings; Thomas Square.

In the Hawaiian legend of Kaulu, it was in a *loulou* palm that Kaulu concealed himself in the Land-Hidden-by-Kane when he was in search of his brother.

A number of other species of pritchardias that have not been identified are growing in Honolulu. On Plate XVII, *B*, is shown an unknown species.

Leaves.—Wedge shaped, $\frac{3}{4}$ foot long, smooth and white below, not woolly; segments about 40, slit less than a foot deep; stems 3 feet long or more. *Flowers*.—Similar to those of other pritchardias. *Fruit*.—Similar to that of other pritchardias; greenish, round, $1\frac{1}{4}$ - $1\frac{1}{2}$ inches thick. *Home*.—Hawaii.

Washington palm, hula palm, California fan palm, weeping palm, palma de Castilla (*Washingtonia filifera* H. Wendland). Plate XII, *B*.—A large, stately palm belonging to a group named for George Washington has a smooth trunk, much of which is covered with a mass of dead leaves, the accumulation of years. In Honolulu they have given rise to the name "hula palm." In desert regions these protect the trunk from heat and drying winds. On dry, stony soil in desert regions of western United States, especially southern California this palm, one of the hardiest in America, grows wild, and some are as much as 80 feet high; in southern United States and in southern Europe it is commonly cultivated. In Honolulu are several.—Kapiolani Park.

The gray-green leaves are fan shaped and are split into two to four score segments nearly down to the middle of the blade. The segments are conspicuously margined with fibers up to a foot long. California Indians used the leaves for building huts, for making baskets and string, the leaf bud as a food, like cabbage, eaten raw or roasted. The flowers are white and hang down as much as three yards on slender stems, which are later weighed with small, elliptical, black fruit surrounded with thin, sweet flesh. The Indians ate this fresh or dried, and the seeds were ground into meal.

Leaves.—Gray-green, cut into segments nearly to middle of blade, 3-5 feet in diameter, fan shaped; segments 40-80, hairy on edges and fibers 6-12 inches long; stems 2-5 feet long, $1\frac{1}{2}$ inches wide at summit, smooth except for stout, hooked spines near base, plano-convex, margins rather thin. *Flowers*.—Spathes long, membranous, smooth; spadices about 9 feet long, much branched, smooth, branches slender and flexuous; flowers white. *Fruit*.—Small, elliptical, black, $\frac{1}{3}$ inch long, with thin, sweet flesh. *Home*.—Southern California and western Arizona.



A



B

PLATE XI. A, BAMBOO PALMS (RHAPIS FLABELLIFORMIS), POLYPODIUM AT BASE; B, LODDIGES'S LATANIA PALM (LATANIA LODDIGESII), MALE TREE IN FLOWER, GIANT REED AT BASE.



A



B

PLATE XII. A, FAN PALM (*Livistona rotundifolia*); B, HULA PALM (*Washingtonia filifera*), POND LILIES, COCONUT PALM AT LEFT, PHOTOGRAPH BY A. R. WADSWORTH.

Washington palm, hula palm, desert palm (*Washingtonia robusta* H. Wendland).—A Washington palm similar in appearance to its relative and probable compatriot (*W. filifera*), can be distinguished by its smaller, more flaccid leaves, and its longer and more slender trunk. It is perhaps less common in Honolulu. The seeds fresh or dried were a food supply of Indians of southern California; after being ground to a pulpy mass they were mixed with meal.—Kapiolani Park; 422 Judd Street.

Leaves.—Flaccid, $3\frac{2}{3}$ feet wide, fan shaped; segments about 80, green and smooth on both sides, $1\frac{1}{2}$ inches broad at widest point, long pale filaments between segments and on margins, each segment bifid and thin; stems $3\frac{1}{3}$ -5 feet long, spiny their entire length, dilated at base. *Flowers*.—Spadices very large, longer than leaves, divided into straw-colored branchlets; flowers $\frac{1}{3}$ inch long. *Fruit*.—Oval, black, shining, about $\frac{3}{8}$ by $\frac{1}{4}$ inch, mesocarp fleshy. *Home*.—Southern California.

Loddiges's latania palm (*Latania loddigesii* Von Martius). Plate XI, B.—The latania palm, found in all tropical countries, in Honolulu is common but only in young states. Adult trees are sturdy and reach a height of 50 feet. Their most striking feature is the cluster of fan-shaped, stiff, frosted leaves, which are split to the middle into many narrow segments. The leaf stems are about as long as the leaves. Pollen and fruit-bearing trees are separate, those with fruit producing branches covered with pear-shaped cases about two to three inches long.—Keeaumoku Street at Experiment Station of Hawaiian Sugar Planters' Association, male tree near the street, a female behind it; grounds of Methodist Church.

Leaves.—Fan shaped, stiff, frosted or bluish-green, 3-5 feet long, matted with hair; split to the middle into several segments, 2 feet long, less than 3 inches wide, unequally pointed, edges spiny in young plants only, young leaf reddish, veins on under side of some mature leaves reddish and downy; stems 3-4 $\frac{1}{2}$ feet long or more, matted with hairs, entire in mature plants and spiny in young. *Flowers*.—Several stalks form at base of leaves bearing clusters of flowers, sexes on separate trees; male: stalks up to $5\frac{1}{2}$ feet long, with 8-12 branches, long; female: stalks more than 3 feet, with 5-6 branches, rounded. *Fruit*.—Brown, pear-shaped cases about $2\frac{1}{2}$ by $1\frac{3}{4}$ inches, 3-angled, containing 3 seeds. *Home*.—Mauritius.

Wine palm, toddy palm, fishtail palm (*Caryota urens* Linnaeus).—Some wine palms grow 60 feet high and about a foot in diameter, some not so large. In their home in India they grow in damp forests, from lowlands to 5,000 feet or higher. In drier Honolulu they seem stunted. Though once abundant they are becoming rare,

as few new ones are being planted and compared with other palms they are short lived. Horizontal rings mark the smooth trunk at regular spaces. The gracefully spreading leaves are large, some 20 feet long and nearly as wide, and they bear many broad-ended leaflets, which are cut obliquely and toothed and resemble fish fins. When the tree has reached maturity it begins to flower near the top of the trunk, the blossoms hanging in long heavy clusters. The flowering continues successively downwards, and when the last cluster has passed and its remarkably many and long strings of round, red, cherry-like fruit have developed the tree dies.

The wine palm has so many and varied uses that if the resourceful Swiss family Robinson had found it alone comprising the vegetation of their tropical isle they could have been fairly comfortable. In India the wood is used for building, the fiber from leaf stems for ropes and baskets and brushes, the pith from the trunk for a starch like sago, the sap for sugar and gin and wine, the terminal leaf bud for food, the wool from the leaf stems for tinder and for caulking boats. The fiber, the most important product, has been shipped from Ceylon to England since 1860 for brooms, etc. The flower stem furnishes the sap for wine, which is first drawn when the tree is 20 years old and which flows for a month every year, sometimes as much as a hundred pints in 24 hours. In Java the man who wishes to make palm wine approaches a tree as a lover and betroths himself to it in the name of the Prophet before he dares to extract the juice. The fruit itself should be avoided, for its juice is sour and irritates the skin—hence *urens* ("burning") in the scientific name. But the seeds are used by the Mohammedans as beads.—1266 King Street; 1472 Thurston Avenue.

Leaves.—Some 20 by 15 feet, gracefully spreading, bipinnate; pinnae 5-6 feet long, curved and drooping; leaflets broad at the end, cut obliquely, toothed, 4-8 inches long; stems fibrous, stout, keeled on back. *Flowers.*—Spathes not entire, tubular, 3-5; spadices 10-12 feet long, pendulous, ordinarily alternate, beginning at top of tree and descending to lowest leaf axil, when tree dies; sexes separate. *Fruit.*—On long hanging strings, red, round, size of a cherry, fleshy; seeds kidney shaped. *Home.*—Tropical Asia.

Bottle palm (*Hyophorbe amaricaulis* Von Martius). Plate XVII, A.—A strangely formed, slow-growing palm, the bottle palm, as a rule is less than 15 feet high in Honolulu, where several are cultivated. At home, in Mauritius, it grows 60 feet high and a foot or two in diameter. The width of the smooth, ringed trunk is greatest



PLATE XIII. ROYAL PALMS (*OREODOXA REGIA*), FLOWERING
GIANT REED AT LEFT.



PLATE XIV. *KENTIA (ACTINOPHLOEUS) MACARTHURI*, BAMBOO PALM
IN POT AT RIGHT, PEPPER TREE AT LEFT.

near the ground (15 to 24 inches), gradually decreases with height, and finally abruptly narrows shortly before the leaves are reached. A few leaves arch stiffly from the top of the trunk. They are long and have many leaflets paired on an orange stem. Pale-green or yellow flowers form in short-stemmed clusters and ripen into small, elliptical fruits.—Entrance to Board of Agriculture and Forestry, King Street.

Leaves.—Stiff, arching, pinnate; pinnae in 40-60 pairs, narrow, pointed, 1-1 1/2 feet by 2 inches, folded longitudinally, margins thickened, recurved at base, 3 veins prominent above and clothed below with rather rigid scales; rhachis orange; stem orange, furrowed above, somewhat triangular at base. *Flowers*.—Spathes many, overlapping in 2 rows; spadix with clustered branches bearing pale-green or yellow flowers, sexes separate on same spadix, stem 1 foot long. *Fruit*.—Clustered on a branching stalk, which is about 1 foot long, straight, or curved oblong, containing elliptical seeds 1/2 inch long. *Home*.—Mauritius.

Chrysalidocarpus, areca (*Chrysalidocarpus lutescens* H. Wendland). Plate VII.—A beautiful palm that is much used ornamentally in houses and also outdoors, where it may grow 30 feet high and have a diameter of half a foot, is the chrysalidocarpus (meaning "golden fruit"), by dealers also called "areca." Its trunk is smooth, ringed, and thickened at the base. The very long, gracefully bending leaves are divided into about 100 forked segments.—Corner of Lunalilo and Pensacola streets; Scottish Rite cathedral.

Leaves.—Very long, pinnate; leaflets almost opposite, lanceolate, 2 feet by 2 1/2 inches, acute, about 100, unequally bifid at apex, near together at base and apex, at middle 2 inches distant, 3 prominent primary veins, which are convex below and acutely 2-faced above; stem about 2 feet long. *Flowers*.—White, small, on a much branched stalk, dioecious. *Fruit*.—Purplish-black, elliptical-turbinate. *Home*.—Madagascar.

Royal palm [*Oreodoxa* or *Roystonea regia* Von Humboldt, Bonpland, Kunth]. Plates V, XIII, XXV.—Like a graceful column carved in long symmetrical curves, the royal palm raises its smooth, whitened, faintly ringed shaft, which terminates in a bunch of immense, dark-green plumes. In 1850 the first of its kind in Honolulu was planted at 1936 Nuuanu Avenue by Dr. G. P. Judd, where it is the first on the right side of the entrance. The scientific name, *Oreodoxa*, of Greek derivation, means "glory of the mountains." The tree is called "one of the grandest of pinnate palms," and is common in Honolulu. It is known to reach a height of 120 feet, though ordin-

arily 40 to 60 feet high and as much as 2 feet wide at the base. On the lower end of the leaf stem is a green leaf sheath, wide and overlapping, which appears as a continuation of the trunk. The prized "millionaire salad," composed of the tender, edible, central leaf bud can be obtained only at the cost of the life of the tree. Small, white flowers grow in clusters at the base of the leaf sheath, three or four appearing at once. The oval, bluish fruit, half an inch long, contains a small brownish seed used in leis.—Surrounding statue of Kamehameha; driveway of Punahou.

Another kind of royal palm, growing on Iolani Avenue, is said to have been brought to Honolulu later.

Leaves.—In a drooping bunch at the top of the trunk, long, plummy; leaflets 2 1/2 feet by about 1 inch, bordering midrib for most of its length at several angles, equally pinnatisect, unequally bifid, midvein thick, margins not thickened; rhachis convex on back, furrowed towards base, pointed towards apex; stem half cylindrical, furrowed above; sheath long, wide, overlapping, green, closely united to others. *Flowers*.—Small, white, clustered closely on large much branched stems at top of trunk; spathes 2, flat, pointed; spadices 3-4 at 1 time, sexes separate; male petals united at base, larger than female and opening shortly before. *Fruit*.—Oval, bluish, rounded at both ends, 1/2 inch long, each containing a stone. *Home*.—Cuba and Panama.

Howea, denea, kentia, thatch palm, flat-leaved palm (*Howea* or *Denea forsteriana* Beccari). Figure 5, a.—The two howeas (*H. forsteriana* and *H. belmoreana*) that are cultivated have stout, ringed trunks topped by numerous long leaves, divided along a common stem into narrow leaflets. They are said to be among the six most popular house palms in the United States, where they are grown in nurseries by tens of thousands. As seeds do not form on these cultivated plants, they must be shipped in from their home in the south Pacific—Lord Howe Island—whence they are sent to Australia and from there to London and New York. Only half the seeds germinate, and they require two to nine months to do so. Thus it seems that many obstacles stand in the way of the grower. The hanging flower clusters are attached between the bases of opposite leaves.

Howea forsteriana differs from *Howea belmoreana* in having leaf segments that turn down, short floral clusters in twos or threes, and olive-shaped seeds 1 1/2 inches long, which require 12 months to ripen. In Lord Howe Island they prefer to grow on plains and low hills, especially near the sea on coral soil.—Grounds of Royal Hawaiian hotel.

Leaves.—Numerous, 10 feet long or more, pinnate; segments many, straight, sword shaped, thinning towards base, smaller towards apex, pointed, bifid more or less, largest ones about 3 feet by 1 1/2 inches, lower surface densely covered with tiny brown scales; rhachis flat in lower part, grooved where segments are inserted; stem about 5 feet long, broad near base, margins acute, convex beneath, flat or slightly concave on top; sheath green except where yellow on medium line, elongate, embracing stem below. *Flowers*.—Spathe 1; spadices intrafoliar, several rising above scars of fallen leaves, 2 1/2 feet long, stem 2/3-1 foot long; flower parts arranged in threes, sexes separate; male: 2/5 inch long, stamens 80-100; female: round, later oval, 6 staminodes. *Fruit*.—Ovate-elliptical, 1 1/2 inches long, ripens in 12 months. *Home*.—Lord Howe Island.



FIGURE 5.—Palm family: *a*, howea (*Denea forsteriana*); *b*, howea (*Howea belmoreana*).

Howea, kentia, curly palm (*Howea belmoreana* Beccari). Figure 5, *b*.—The more popular kind of howea (*H. belmoreana*) is smaller, less spreading than the other, has very graceful foliage, more leaves and leaflets, the leaflets turned upward, the leaves shorter. A single cluster of flowers grows from the leaf axils, and the male flowers have fewer stamens. Though much like those of its relative, the seeds, which are greenish-black, average larger and shorter and require three years to mature on the tree. In Lord Howe Island this howea grows at higher elevations and avoids the coral soil of the plains.—Corner of Heulu and Keeaumoku streets; near main entrance of Royal Hawaiian hotel.

Leaves.—Seven feet long; segments turned upward, without brown scales; stem 1 2/3 feet long or more; otherwise much like *H. forsteriana*. *Flowers*.—In single spike in leaf axil, 3 1/3-5 feet long; stem reddish, woolly; male: 30-40 stamens; otherwise much like *H. forsteriana*. *Fruit*.—Similar to *H. forsteriana* but larger and needs 3 years to mature. *Home*.—Lord Howe Island.

Kentia (*Actinophloeus macarthurii* Beccari). Plate XIV.—The so-called “kentia” is a strikingly handsome but rare palm. It can survive only in places protected from wind storms, as its slender trunk, which is ringed somewhat like bamboo, is easily broken. As new plants periodically arise from the roots, they grow in clusters. The leaves bear long, narrow leaflets on two sides of a stem. Flowers are borne in clusters.—Two clumps, corner of Victoria and Lunalilo streets; 1328 Matlock Avenue.

Leaves.—Pinnate; leaflets linear-lanceolate, midveins scaly beneath, rachis angled above; stem channeled above, rounded below. *Flowers*.—In clusters. *Fruit*.—Spadices have sharply 4-angled branchlets. *Home*.—Moluccas to northern Australia.

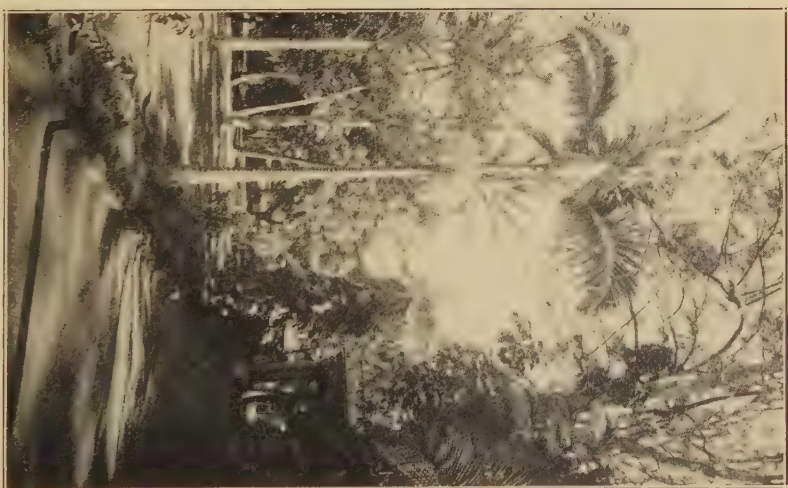
Red palm (*Dictyosperma alba* Wendland and Drude var. *rubra* Hortorum). Plate XV, A.—The red palm, with trunk gradually tapering to a height of 50 feet, has a slender trunk, smooth except for slight indentations of leaf scars, appearing as close horizontal rings. This attractive palm is growing in many tropical countries, and it is common in Honolulu. The long, flat, drooping leaves are composed of many leaflets, which when young have red veins and margins. At the tips of the leaves, the leaflets are joined. As in the royal palm, long sheathlike attachments below the leaf stems look like a continuation of the trunk; at their base flowers form.—1420 Piikoi Street.

Leaves.—Drooping, as long as 12 feet, pinnate; pinnae equal, linear-lanceolate, 2-3 feet by 2-3 inches, each with 3 veins on both sides of middle vein, margins thickened, veins and margins reddish in young leaves, apical pinnae joined; stem 1/2 foot to 1 1/2 feet long, grooved, joined to a long sheath. *Flowers*.—Spathes 2, flat on back, papery; spadix 2 feet long, branches reflexed, 20-30 inches long; male flowers rather large, whitish. *Fruit*.—Oval, pointed, about 1/2 inch long, purple. *Home*.—Mauritius.

Alexandra palm (*Archontophoenix alexandrae* Wendland and Drude). Plate XV, B.—Several examples of the elegant Alexandra palm are growing in Honolulu. In general appearance it resembles the royal palm and red palm. At the top of its tall, slender trunk, with a succession of raised rings—leaf scars—is a spreading cluster of long, flat leaves, somewhat like coconut leaves. The leaflets grow well down on the stem, which is channeled and as in the royal palm has a sheathlike continuation. Encircling the base of these sheaths grow the branching flower stalks, one on each side, with their many



A



B

PLATE XV. A, RED PALM (*DICTYOSPERMA ALBA* VAR. *RTERA*), HIBISCUS AT LEFT, CROTON AT RIGHT;
B, ALEXANDRA PALM (*CARCHINOTOPHOENIX ALEXANDRAE*), POTIOS IN BACKGROUND,
LEMON-SCENTED GUM AT RIGHT.



PLATE XVI. FEATHERY COCONUT PALM (*COCOS PLUMOSA*).

flowers. The fruit is small, red and nearly round.—Grounds of Queen's Hospital.

Leaves.—Pinnate, several feet long; segments as much as $1\frac{1}{2}$ feet by 1 inch, equal, many, pointed or notched, cut to midrib, green above and some whitish beneath, rhachis very broad and thick and smooth or scurvy; midveins prominent; stem channeled above, continuing downwards in a long sheath tightly united to top of trunk. *Flowers*.—Spathes 2, entire, compressed, $1\frac{1}{2}$ feet long; panicle 1 foot long and broad, much branched, on short stalks encircling base of leaf stalks; flowers rather large, male with 6-14 stamens. *Fruit*.—Red, nearly round, about $\frac{3}{4}$ inch long. *Home*.—Queensland.

Oil palm (*Elaeis guineensis* Jacquin).—One of the most ornamental palms is the oil palm; but it is not common in Honolulu. Though thick-set and not exceeding 30 feet in height, a young tree, at least, suggests a dwarf date palm. For its trunk bristles with stubs of old leaf stems and its many leaves spreading from the top are long and divided into many segments on a long midrib. When leaf stubs drop, the trunk is found to be coarsely and deeply ringed. The tree grows in many tropical countries. In its home in Africa, leaf stems and fiber at the base of the stems are made into baskets, brooms, cushions; and the young undeveloped leaves are relished as a vegetable. Flowers are crowded on much branched clusters, the pollen-bearing and fruiting flowers being borne separately, and from the pollen-bearing flower spikes Africans obtain a drink. The one-seeded fruit in its bright-red or yellow oily husk hangs in large clusters. In Africa the nutritious oil derived from the husk is an important native food and is used at most of their meals. It is also used to oil their bodies and for wounds and is an ingredient for the manufacture of soap. Oil from the nuts is preferred for lighting and a soup is also made from them. The fruit is exported in large quantities for use in soap and candles.—Capitol grounds.

Leaves.—Twenty to 40, spreading, 10-15 feet long, pinnate; leaflets 100-160 pairs, linear-lanceolate, pointed, 3 feet by 1-2 inches, same color above and below; stems 4 feet long or more and 6 inches more or less wide, bearing 50-60 pairs of spines. *Flowers*.—Crowned on many branches, spadices interfoliar, 6 or 8 at once, sexes separate; male: precede female spadices by weeks, in oval mass about $\frac{1}{2}$ foot by 5-7 inches; female: larger, no stamens, 1 spiny bract, more massive inflorescence of about 100 branches. *Fruit*.—One-seeded, oval drupes with bright-red or yellow, oily husk, in large clusters; seeds oily. *Home*.—Tropical Africa.

Cohune nut palm (*Attalea cohune* Von Martius). Plate X, B.—“Magnificent,” the meaning of the generic name, *Attalea*, is an appro-

priate adjective for this grand-looking tree, which appears a little like a thick-trunked coconut palm. The smooth, gray, ringed trunks of some reach a height of 50 feet; in Mexico, a much greater height. The leaves, gigantic, dark-green plumes, rise nearly as high above, arching widely and gracefully at the ends. The trees are said to be especially beautiful in avenues, where they form Gothic arches. Yellow flowers in clusters up to six feet long appear between the leaves. They have a heavy, unpleasant odor, which attracts bees. Brown, oval nuts resembling small coconuts ripen in large clusters, a new crop every year.

In Mexico the cohune nut palm is one of the most important palms commercially. The trunk is used for buildings and its sap for wine; the mature leaves furnish a thatch and the young leaf buds a cabbage that is cooked and eaten; the seeds, which are 50 per cent oil, yield an oil said to be superior to coconut oil for candle and soap-making and for machine oil. The nuts also are eaten by cattle, the seeds by human beings.—Moanalua Gardens; Capitol grounds bordering Hotel Street; park corner of King and Keeaumoku streets.

Leaves.—Erect, 20-30 feet long, pinnate; leaflets 30-50, about 18 inches long, extending nearly to base of stem, dark-green, on under side of rhachis hanging vertically, on upper side standing vertically; stem thick, dark-brown below, flat and green on top. *Flowers*.—In clusters between leaves 4 1/2-6 feet long, yellow, unpleasant odor. *Fruit*.—In large, grapelike clusters, resembling small coconut, short beaked, oval, about 2 inches long, brownish, each containing 1-3 seeds. *Home*.—Central America.

Coconut palm, coco palm, niu (*Cocos nucifera* Linnaeus). Plates V; XII, B; XVIII.—The best-known palm is the coco palm. Its slender, flexuous, graceful trunk is crowned with a small cluster of feathery leaves, and some trees ascend as high as 100 feet, always growing on low land near sandy shores, where they form groves or are planted for ornamental purposes for avenues and lawns. The trunk is thickened at the base and from base to summit is ringed with leaf scars. Among the numerous varieties in Honolulu are some with shorter trunks.

The tree grows more luxuriously in humid South Pacific islands than in Hawaii, where its crops of nuts are not raised for commercial purposes, though formerly large plantations were cultivated by the Hawaiians, to whom the leaves for baskets and thatching and the nuts for food were indispensable. The midrib of the leaflets also has many uses. The leaves are flat, four to six yards long, and much



A



B

PLATE XVII. *A*, BOTTLE PALM (*HYOPHORBE AMARICAULIS*); *B*, CHINESE FAN PALM (*LIVISTONA CHINENSIS*) AT LEFT, PRITCHARDIA OF UNKNOWN SPECIES AT RIGHT, BANYAN AT RIGHT BACKGROUND.



PLATE XVIII. COCONUT PALMS (*COCOS NUCIFERA*).

divided. The long, thick stems are fibrous at the base. Unfortunately an insect called the "coconut leaf roller" makes the leaves ragged, but does not fatally injure a tree. Flowers grow in branched sprays, and palm wine or toddy is obtained from them. The fruit ripens in nine to ten months. It has a smooth, thick, fibrous husk surrounding a large nut, the pure-white, solid, sweet pulp and cloudy water within being well known in most parts of the world. Fresh meat contains about 40 per cent oil, and the dried meat or copra is shipped to Europe and the United States for manufacture of soap, coconut butter, and for a neutral oil in cooking. Where abundant, the meat is fed to domestic animals. When grated it is eaten with curry and is especially palatable when the nut is young. The husk is used for mats and brushes. *Cocos* is Portuguese for "monkey," for the nut inside the husk looks somewhat like a monkey's head.

Some warm country bordering the Pacific was evidently the home of the coconut, and somewhere on the shores of the Indian Ocean seems to be more probably the place than Central America.—Halekulani hotel; plantation on King Street opposite Thomas Square.

The coconut palm appeals to the imagination of man. Many myths spring from the resemblance of the coconut to a head, and there are stories of the first one sprouting from the head of an eel, of a man, of a child. Perhaps the most appealing of these is the Tahitian. Famine was in the land, and there remained only red clay to eat. The mother of three children died of hunger, and the grief-stricken father took his children into the mountains and left them while he went farther in search of food. When he returned, the little ones were dead; but from their heads leaves were growing. In a few days these were full-grown trees that yielded fruit, and from these three trees came all the varieties of coconut known in Tahiti. Chinese legend tells of the Prince of Yue whose head was cut off and hung in a tree by his enemy. The head was changed into a coconut, and hence it is called "Yue-wang-t'ou," the head of the Prince of Yue.

Samoa has a legend of a native Joan of Arc who was so indignant that the ruler compelled the people to climb coconut trees with their heads downward that she formed an army of men and overcame him. Hawaiian legend tells of a magic coconut palm that was concealed under a calabash. When the queen removed the cover it grew and

transported her to heaven that she might confer with her sky-dwelling grandfather. India has a similar myth.

The East Africans prize the coco palm so highly that to cut one down is an unforgivable crime, as serious as matricide.

Hawaiian riddles: Three walls and you reach water. A man with three eyes; he can cry out of only one. Something goes up brown and comes down white. My sweet water-spring suspended in air.

Leaves.—Gracefully spreading, 12-18 feet long, pinnate; leaflets 2-3 feet long, leathery, drooping, narrow, tapering to a point; stems expanding broadly at base into sheathing network of tough fibers, 3-5 feet long. *Flowers*.—Simply branched spikes in axils of lower leaves, in a cylindrical spathe, which splits lengthwise, sexes separate; male: in long sprays, small, sepals and petals opening by valves; female: generally 1 at base of male spray, larger than male, nearly round, sepals and petals leathery, overlapping. *Fruit*.—A fibrous, thick, smooth, oval, 3-angled husk, surrounding a round nut with a bonelike shell with 3 hollows near the base (germinal pits, the soft one of which is above the fertile germ, the 2 hard ones above 2 arrested germs); within is a thick layer of white, solid, compact, oily pulp, edible, sweet, containing a hollow with sweet, clouded water. *Home*.—On shores of Indian Ocean more probably than Central America.

Feathery coconut palm (*Cocos plumosa* Hooker). Plate XVI. —The feathery coconut palm, which is not common in Honolulu, is easily distinguished from the ordinary coconut palm. It is straight, about a foot thick, and ringed every foot with a leaf scar. Ordinarily about 30 feet high, it grows 50 feet high in Florida and southern California, where it is used in avenues, and it reaches its full height rather quickly. The leaves form a loose, beautifully spreading crown, are more nearly erect and stiffer than those of the coconut palm, and are not flat but plumelike. The stem, about a third as long as the blade of the leaf, clings to the trunk for years after the leaf has died. Flowers hang in clusters, later, small, oval, pointed fruit.—Two beside entrance to Archives building, Capitol grounds.

Leaves.—Bending gracefully, feathery, 12-15 feet long, recurving, pinnate; pinnae branching from midrib in more than 1 plane, mostly in groups of 2-4, 1 1/2 feet long, deflexed near apex; stem about half the length of blade, nearly triangular at base, much dilated, gray-brown, keeled, fibrous margined. *Flowers*.—Spathe about 2 1/2 feet long; spadix axillary, somewhat stemmed, much-branched, hanging; flowers sessile, many, waxlike, mostly male. *Fruit*.—Oval, pointed, about 1 inch long. *Home*.—Brazil.

Giriba palm (*Cocos romanzoffiana* Von Chamisso).—A kind of coco palm that is rather rare in Honolulu has a straight trunk that

bulges somewhat in the middle. It grows 20 to 40 feet high and on top bears a crown of long, arching leaves and many sword-shaped leaflets. From the long, drooping flower clusters develop many fruits, which are the size of a walnut.—Kapiolani Park.

Leaves.—About half as long as trunk, withered ones deflexed and pendent, upper spreading and incurved; leaflets numerous, sword shaped, conduplicate at base. *Flowers*.—Spathes club shaped when closed, growing between leaves, spadices 6-8 feet long, with somewhat compressed stems, sexes separate; male: on lower 2/3 of branches with females, alone on upper part, petals about 1/2 inch long, calyx 1/12 inch; female: roundish, 1/4 inch long. *Fruit*.—Each the size of a walnut, many in clusters. *Home*.—Brazil.

ARUM FAMILY

(Aracaceae)

Taro vine, pothos [*Pothos* (formerly *Scindapsus*) *aureus* Linden]. Plate XV, B.—The taro vines are strikingly large and strong and are common in Honolulu, many draping royal palms and algarobas. They have cordlike stems, and their branches bear huge, thick, alternate, heart-shaped leaves. Those of the pothos are entire and green, mottled with yellowish-white—markings that are absent from leaves grown in deep shade. The flowers are rarely if ever seen in Hawaii. They are small and are crowded on a sort of spike, which is partially surrounded by a persistent sheath, and one-seeded berries ripen from them. In the Solomon Islands this vine is native. In Honolulu, good examples are growing on the lawn at the corner of Lunalilo and Victoria streets, also at the corner of Dominis and Makiki streets, and on Punahou campus.

Anthurium (*Anthurium*, several species). Figure 6, a.—In greenhouses in the United States, and in protected parts of gardens and on porches in Hawaii, the anthuriums, evergreen plants from tropical America, are cultivated for the sake either of their beautiful large spear or heart-shaped leaves, which are velvety or satiny and patterned by veins, or for their flowers, many of the most attractive of which accompany rather plain foliage. The reverse is also true, rather plain flowers seeming to accompany pretty leaves. From each leaf axil a flower rises. The name "anthurium" is Greek for "tail flower," and this applies well to the flower, which consists of a conspicuous winglike bract, from which rises a tail-like, cylindrical spike closely packed with small flowers. From the berries that develop and

also from suckers and cuttings new plants grow. In Honolulu several different kinds of this plant can often be seen in florists' shops and at the Academy of Arts.

Taro vine, monstera (*Monstera deliciosa* Liebmann). Figure 6, *e*.—One of the grandest of the taro vines sends long aerial roots down towards the ground, which many do not reach. The huge leaves are perforated or lobed, and some have stems a yard long. For its fruit this vine is perhaps most noted. When ripe an edible yellow-green cone hangs down, and within its covering of small hexagonal plates



FIGURE 6.—Arum family: *a*, anthurium, plain-leaved plant with ornamental flower, separate flower from plant with ornamental leaves; *b*, caladium (*Caladium bicolor*); *c*, taro (*Colocasia antiquorum* var. *esculenta*), showing deeply and shallowly cleft leaves, both on plants growing in water; *d*, native ape (*Alocasia macrorrhiza*); *e*, monstera (*Monstera deliciosa*), leaf and fruit; *f*, dieffenbachia (*Dieffenbachia* sp.).

is a delicious creamy-white pulp, said to resemble a mixture of banana and pineapple flavors. Unfortunately, calcium oxalate crystals present in the pulp cause itching in the throat. The fruit needs 18 months to mature and develops in greatest numbers on plants not allowed to climb. In eastern United States, this is a favorite greenhouse vine.—Hillebrand Gardens.

Leaves.—Perforated or lobed, 1-2 feet long or more, leathery; some stems 3 feet long. *Flowers*.—Perfect; spadix up to 8 inches long. *Fruit*.—Appears like a long pine cone, 6-12 by about 2 1/2 inches, yellow-green, rind of small hexagonal plates that can be removed easily when the fruit is ripe, pulp juiceless and creamy-white. *Home*.—Mexico.

Dieffenbachia (*Dieffenbachia*, several species). Figure 6, *f*.—Popular porch plants in Honolulu are several kinds of dieffenbachia—low plants from warm parts of America, with thick, ringed stems, which are partly creeping, partly erect. Their leafy tops are handsome, some kinds having their large, smooth, elliptical leaves spotted with white. Each has a thick midrib, which continues as a cylindrical and finally half-cylindrical stem. After the plants reach a height of a few feet, when they begin to have fewer and smaller leaves, the tops should be cut off and the pieces replanted. The flowers are a compact cylindrical spike enveloped in a single bract, and the fruit consists of large, red berries. On the grounds of the Royal Hawaiian hotel are several of these plants.

Ape (*Alocasia macrorrhiza* Schott). Figure 6, *d*.—The *ape* is like a large, spreading taro plant and is very decorative. Its large stems, springing from underground stems, are as thick as a man's arm, are ringed, and rise two to four feet high. The huge, heart-shaped leaves add several feet to the height. In a color form they are spotted with white. The flowers have a sickish odor and are packed on a long spike enclosed in one or two greenish-yellow sheaths. Cherry-like berries form later. The *ape* is from southern Asia and has been cultivated and naturalized in many Polynesian islands. It is common in Japan, where the floor of at least one primeval forest (under government protection) is overgrown with *ape* and other tall herbs and large ferns. Formerly Hawaiians cultivated it in small patches of dry land in the mountains and in times of great scarcity ate the coarse stem.—Central court, Academy of Arts; grounds of Territorial Office Building; grounds of Royal Hawaiian hotel.

According to Rarotongan legend, the *ape* was one of the plants used by Ru to hoist the heavens above the earth. In Hawaiian legend the mud hen tried to deceive Maui by telling him that fire was concealed in the *ape*. When the Hawaiian hero, Aukele, was thrown into a pit by his brothers, his lizard grandmother, with clairvoyant power, showed him a large land and a small land mirrored upon two *ape* leaves and told him what those lands would mean in his life.

Leaves.—Blades heart shaped, lower lobes not joined, glossy, dark-green (some spotted with white), 2-4 feet by 6-18 inches, veins distinct; petioles 2-4 feet long, thick at base. *Flowers*.—Packed on a spike surrounded by one or two large, pale, greenish-yellow bracts, which are 6-12 inches long (slightly longer than spike), rolled together at the base, and having an obtuse or pointed and incurved blade; tube 3-4 inches, narrowly ellipsoid, limb pale-green, in some flowers spotted or streaked with red. *Fruit*.—Red berries about half an inch in diameter. *Home*.—Tropical Asia, possibly also Australia and islands of the Pacific.

Ape (*Alocasia* species).—One of the commonest kinds of *ape* cultivated in Honolulu, as along the front of the Academy of Arts, is said to come from Japan. Its chief apparent distinctions from the Hawaiian *ape* are in the leaves, which are folded somewhat along the midrib and are dull, those of the Hawaiian kind being flat and glossy, and in the flowers, which have a pinkish flowering sheath. It is perhaps a variety of *Alocasia macrorrhiza*. Other forms are seen here and there, as one at Fernhurst with leaves having purple stems and veins.

Taro, kolkas, dasheen (*Colocasia antiquorum* Schott var. *esculenta* Schott). Figure 6, *c*.—Taro is a food plant from tropical Asia that is common in many countries: Polynesia, Australia, northern New Zealand, Arabia, Egypt. In their voyages in the Pacific, the Polynesians carried it for food and for planting. To Hawaiians it has supplied in early and recent times the principal food, to Polynesians in other islands it has been less important. The starchy, oblong, tuberous root is what the plant is chiefly raised for, and in the 8 to 16 months needed for its development this may reach a diameter as great as 6 inches. Three to five tons an acre are yielded. It is prepared to eat by baking or boiling or as poi, poi being made by pounding the cooked tuber, mixing it with water, and allowing it to ferment a little.

Taro is grown under water or in rainy places in rich soil, being known as wet-land and dry-land taro, and that from Manoa Valley is said to be the best near Honolulu. About 200 varieties were being grown in Hawaii when the white man arrived, but the number has gradually decreased. The plant is about a foot high and consists of a graceful cluster of a few heart-shaped leaves, attached near their center to long, thick stems. In different kinds of taro the leaves are attached to the stems at greater or less distances from the base of the cleft in the blade, which is correspondingly shallow or deep. The head of leaves is replanted for a new crop or eaten, being cooked into a green resembling spinach, the stems resembling asparagus. But if not thoroughly cooked, all parts of the plant give an unpleasant stinging sensation when eaten due to the presence of crystals of calcium oxalate, which are expelled from capsules when pressure, as in eating, is exerted on them. If the taro is cooked a long time the capsules lose the power to expel the crystals.—Corner of School and Palama streets; central Manoa Valley.

In Samoan legend Losi brought taro from the skies on one of his voyages. In Tahiti they will tell you that it sprang from the feet of a man, whose lungs became the leaves. Hawaiians say it was brought by Wakea—Father Heaven and ancestor of all their chiefs. A legendary heroine, Hoamakeike, was said to have been born in the form of a taro bulb and thrown into a trash pile. In a vision, her grandmother saw the spirit of the child and she rescued the rainbow-arched bulb, which in two days became a girl child without a blemish.

Two beautiful taros loved each other very much. When a chief pointed them out as food for a feast, they moved to another part of the patch. This happened again and again until in desperation they took wing and flew from taro patch to taro patch; but they were always discovered by the angry chief. Finally, a kindly Hawaiian took pity on them, and in his taro patch they lived to happy old age.

Much of the taro of Old Hawaii was said to have been planted by the *menehunes*, the Little People who worked only at night. Taro stems, the cooked leaves of taro, ferns, and shrimps were their favorite food. "The taro is luxuriant; like the banana stem are the stalks of the taro; the leaves of our taro are as large as the banana" was part of a *tapu*-lifting prayer to the god of husbandry. During

the Chinese Feast of Lanterns it is an old custom to eat taro under the lanterns in order to become bright eyed and clear sighted.

Proverbs: "This one will not be taken by an old taro leaf, but only by the tender bud of the plant"; used in disdain of an old suitor. "A single roll of cooked taro leaf is delicious if seasoned with affection." Riddle: Who is the little man with swaying chin, swaying chin? Answer: the taro leaf.

Leaves.—Oval heart-shaped, dark-green, lower lobes joined part way, blade attached to stem near center of lower surface (in some attached to stem at base of cleft or close to it), about 1 foot long, smooth, velvety above; stems range in color from green to purple. *Flowers*.—Several spikes about 6 inches long, each surrounded by a large, yellow, pointed, oval bract, from 1 axil, shorter than leaf stems; each flower about 1 1/2 inches long, male and female on 1 spike but separated by an interval covered with flat, oblong neuters. *Fruit*.—Oblong, furrowed seeds. *Home*.—Tropical Asia.

Caladium (*Caladium bicolor* Ventenat). Figure 6, *b*.—From underground stems or tubers, low clusters of the caladium raise their nodding, beautifully marked leaves, shaped like large arrowheads, on gracefully arching stems, which are three to seven times as long as the blades. They are tipped with a hard point at the apex, while the two basal lobes are round tipped and joined for a third or so of their length. The blade is whitish on the under side, on top towards the apex primrose. Some of the many varieties are more or less variegated with white, pale-green, red, purple. These South American plants are used in many gardens in Honolulu to border paths and beds, as on the grounds of the Royal Hawaiian hotel.

PINEAPPLE FAMILY

(Bromeliaceae)

Pineapple (*Ananas sativus* Schultes). Plate XIX.—To the pineapple Hawaii owes world-wide fame. For this fruit is its most widely advertised product and one of its largest industries. From their home in Cayenne, French Guiana, plants were taken to England, tried out in Kew Gardens, and bred up until the excellent smooth Cayenne variety was produced. By 1910 the pineapple industry had become well established in Hawaii, where 5,000 to 10,000 plants grow on an acre. New plantations are set out from April to November, and they mature in 16 to 20 months, fruiting all the year, but mostly in sum-



PLATE XIX. PINEAPPLES (*ANANAS SATIVUS*), LARGER PHOTOGRAPH
BY R. J. BAKER.

mer, especially in July and August. They are set out in single, double, or triple rows and will grow on different kinds of soils if well drained, and from sea level to more than 1,200 feet, thriving in a belt drier than the cane belt and just above it. The plants have a mortal enemy in manganese, which changes soluble ferrous compounds in the soil to insoluble ferric compounds, thus making the essential element, iron, unavailable. If grown in such soil the plant sickens and the leaves turn yellow; but they can be revived by spraying with iron sulphate, which runs down to the leaf bases and thence to the roots. A stalk bears fruit only once. Propagation is by suckers coming from leaf axils, by the leafy crown of the fruit, by slips on the stem, and by stumps or bases of old plants. Replanting is done after three to ten years.

The plant is two to four feet high and consists of a rosette of stiff, sword-shaped, saw-edged leaves growing on a single stem. From the leaves is extracted a fiber that is good for textile fabrics, a product for which they are cultivated in Formosa, the Philippines, and southern China. From a fine quality of this fiber the "pina" cloth of the Philippines is manufactured. The plant is cultivated for fruit in several countries, as Hawaii, Cuba, the West Indies, Florida, Singapore, Queensland. An acre yields ten to twelve tons of fruit in Hawaii, where only one commercial variety is raised: the smooth Cayenne or Hilo variety, which has barrel-shaped fruit. Many strains of this variety have been produced, differing somewhat in shape and color of fruit, number of slips, size of leaves. Long before the commercial pineapple was introduced a small spiny kind, called *hala-kahiki* (meaning "hala from Tahiti"), ran wild in Hawaii and is still found. As it is also growing in other parts of Polynesia it may have been introduced in early times by the Hawaiians. Barrel-shaped fruit weighing four pounds is best for canning and for this purpose is picked when fully ripe; for shipping it is picked green. It is good raw, in jams and preserves, and canned. An important by-product is pineapple bran. This is made from the large proportion of waste, formerly burned at great expense, now known to be good feed, if mixed with other foods, for cattle, dairy cows, and mules.—Plantations outside city limits, Red Hill and beyond.

The first mention of pineapple in English literature is said to be in Evelyn's diary, where he states having tasted it at the table of Charles II. "He is the very pineapples of politeness!" is a line

from an early English play. In early American architecture a pineapple carved over the door was a symbol of hospitality.

Leaves.—Many, long, stiff, coming gradually to a point, margined with fine sawlike teeth, sword-shaped, dull-green or whitish, fibrous. *Flowers.*—A green head of fleshy flowers, with fleshy, persistent bracts, imperfectly developed. *Corolla.*—Outer perianth calyx-like, six-cleft. *Stamens.*—Six. *Pistil.*—One style. *Fruit.*—On a stem rising from the center of the leaves, like a pine cone in general appearance but much larger, brown or green, weighing about 4-14 pounds, pulp sweet and juicy and containing citric acid, topped with rosette of leaves like those of the plant but much shorter and comparatively wider. *Home.*—French Guiana.



FIGURE 7.—Pineapple family: billbergia (*Billbergia thyrsoides*).

Billbergia (*Billbergia thyrsoides* Von Martius). Figure 7.—In South America billbergias establish themselves on larger plants and spend their lives in a more or less exalted position. In Honolulu they are present in a few gardens, where they grow on the ground. Their broad, pale-green, stiffly curving leaves form a regular rosette, the base of which often holds water, and from the center of which, in season, a short, red spike rises bearing many flowers. Before dying of old age a plant produces around its base two to five young plants.—Grounds of University of Hawaii, behind Hawaii Hall.

Leaves.—In rosette, broad-ligulate, rather stiff and leathery, 1-2 feet long, pale-green, sharp pointed, margined with spines, upper surface concave. *Flowers.*—In spike rising from center of leaf cluster, shorter than leaves, farinaceous, closely covered with red bracts; flowers many, bright-red, petals bent back, in some varieties purple-tipped. *Calyx.*—Three-parted. *Corolla.*—Petals long, 3. *Stamens.*—Exserted, 6. *Pistil.*—Style threadlike. *Fruit.*—Berry-like. *Home.*—Brazil.

Achmea (*Achmea* species).—The achmea consists of a cluster or rosette of long, hard leaves, which may or may not have saw-

toothed edges. From their center rises a cluster of flowers with conspicuous, pointed floral bracts or leaf bracts. The three tongue-shaped petals do not open widely, though they are two to three times as long as the spine-pointed sepals. This tropical South American plant is rare in Honolulu, one growing on Ernest Street, near Luna-lilo Street.

Spanish moss, Florida moss, long moss, "Mr. Dole" (*Tillandsia usneoides* Linnaeus).—Hanging like gray veils from branches of trees in Florida, the moisture-loving Spanish moss is commonly seen. Locally its appearance has won it the name of "old man's whiskers." It has a wide geographical range—from Virginia across to Texas and down through Central America to Brazil. Here and there in drier Hawaii it can be seen hanging from baskets around houses in less luxuriance. It has slender, hoary-gray, rough, stems and scattered, narrow leaves. Seeds provided with soft hairs are wafted by the wind to homes on branches of trees. Besides being ornamental this plant is useful in packing and in upholstery.—In hanging baskets.

Leaves.—Scattered, narrow, 1-3 inches long. *Flowers*.—Solitary in leaf axils, small, inconspicuous, with yellow petals bent back at the end. *Fruit*.—Seeds provided with soft hairs. *Home*.—Eastern Virginia to Brazil.

SPIDERWORT FAMILY

(Commelinaceae)

Wandering Jew, honohono (*Commelina nudiflora* Linnaeus) Figure 8, *a*.—All over the temperate and tropical world and commonly in Hawaii, the wandering Jew is known as a low, creeping weed that roots at the joints and sends up from the axils of broad grasslike leaves small, irregular-shaped, bright-blue flowers that brighten the green background. It is a forage plant relished by cattle and is used as feed in dairies. According to Bailey, the name *Commelina* was given by Linnaeus in honor of three brothers in Holland named Commelin, two of whom were botanists. They are represented by the petals of the flower, the two large ones standing for the two botanical brothers, the small third one for the brother who was not a botanist.—On roadsides.

Leaves.—Lanceolate. *Flowers*.—Small, irregular, blue, in leaf axils. *Calyx*.—Colored, sepals unequal. *Corolla*.—Petals 3, 2 side ones rounded, long clawed, and larger than the basal one. *Stamens*.—Six, 3 shorter than the other 3. *Fruit*.—Capsule, 3-lobed. *Home*.—Tropics.

Wandering Jew (*Commelina benghalensis* Linnaeus).—Here and there on roadsides in Honolulu, as on Oahu Avenue near its junction with Manoa Road, a wandering Jew with remarkably large blue flowers is growing. Except in size of flowers and in the shorter and wider leaves, it closely resembles the small-flowered kind. In other tropical countries, as in Ceylon it is common at low elevations. Cattle relish it.



FIGURE 8.—Spiderwort family: *a*, wandering Jew (*Commelina nudiflora*), leaves and flower; *b*, tradescantia (*Rhoeo discolor*); *c*, wandering Jew (*Zebra pendula*), leaves and flower.

Tradescantia (*Rhoeo discolor* Hance). Figure 8, *b*.—A short-stemmed herb with smooth, sword-shaped, succulent leaves set closely together is the tradescantia, a pretty rosette plant. The leaves are variegated, being green on top and reddish-purple beneath. From leaf axils, many small white flowers in boat-shaped structures make their appearance on short stems or none, and they soon wither.—Along road up Manoa hill; grounds of University of Hawaii.

Leaves.—Alternate, sheathing, long-linear-lanceolate, set closely on a short stem, 8-12 inches long, under side purple-red. *Flowers*.—White, small, many in a boat-shaped, spathe-like structure arising in leaf axil, sessile or nearly so. *Calyx*.—Sepals 3, more or less petal-like. *Corolla*.—Three, soon withering. *Stamens*.—Six. *Fruit*.—A 3-loculed, dehiscent capsule. *Home*.—Mexico and West Indies.

Wandering Jew (*Zebrina pendula* Schnizl). Figure 8, c.—One of the so-called "wandering Jews" is easily distinguishable by its leaves and flowers from the others to which it is closely related. The leaves are reddish-purple beneath, above silvery with a purple band down the middle and around the edges. The flowers are small and crimson. The stems trail along the ground, rooting at the joints, spread readily, and grow easily from pieces of the stem. In temperate countries, this plant is common in greenhouses, in some covering the ground underneath benches. It is used much in hanging baskets. In Hawaii it is common outdoors, both creeping on the ground and hanging in baskets, growing well in shaded places. Because of its spreading or wandering habit the plant resembles the legendary Jew, who because he struck Christ on his way to Golgotha has since wandered in different lands without being able to find a grave. According to a widespread superstition it is bad luck to have the wandering Jew in the house.—In several gardens; in greenhouses.

Leaves.—Lance-ovate, sessile, under surface reddish-purple, upper surface silvery-white suffused with purple and with a purplish band down the middle and around the margins, never green; sheath about 1/2 inch long, hairy at top and bottom or in its entire length. *Flowers*.—Few, sessile, about 2, rose-red, in 2 boat-shaped bracts, 1 bract much smaller than the other. *Calyx*.—Three sepals. *Corolla*.—Tubular petals, not free, 3. *Stamens*.—Six, equal. *Fruit*.—Capsule, 3-loculed, dehiscent. *Home*.—Mexico.

WATER-HYACINTH FAMILY

(Pontederiaceae)

Water hyacinth (*Eichhornia speciosa* Kunth). Figure 9.—As an ornamental plant floating on pools, the water hyacinth can be seen here and there in Honolulu. In the early 'eighties Mr. E. W. Jordan imported what were probably the first plants seen here. If not placed in water more than three inches deep, the plants may become weedy and unattractive, and in parts of Florida they grow

so rankly in rivers as to obstruct navigation. They are sensitive to frost. Long, slender roots bearing many short, horizontal fibers descend from the plant to the soil after the plant has flowered and hold it in place. A different kind of root, ordinarily thick and fleshy, extends horizontally in different directions. The leaves are clustered and have rounded, greatly swollen stems, which contain much air space and act as floats. The flowers, also clustered, are bluish and short lived.—Academy of Arts.



FIGURE 9.—Water-hyacinth family: water hyacinth (*Eichhornia speciosa*).

Leaves.—In tufts, round or oblong, smooth, longitudinally concave, veins many and parallel; stems constricted at each end, rounded and greatly swollen between, bladder-like, containing much air space, sheathed. *Flowers*.—About 8 in one loose spike, rising from sheath of uppermost leaves; individuals 6-lobed, upper lobe larger than others and bearing a large patch of blue with oblong or pear-shaped spot of bright-yellow in the middle, membranous, short lived, inner segments not serrated; stem solitary, long, with wavy-margined sheaths at and above middle. *Stamens*.—Six: 3 long, 3 short, all curved upwards. *Pistil*.—Style slender, stigma lobed. *Fruit*.—Capsule, membranous, 3-celled, opening at the middle of the back of each cell; seeds small. *Home*.—Brazil (Bailey); tropical America (Kew Index).

LILY FAMILY

(Liliaceae)

The lily has always had a strong appeal to the imagination of man. Among the Romans it was dedicated to Juno, queen of the gods. In France it is the national emblem, and the kings of France were called "lords of the silver lilies." In Chinese mythology Kwanyin was persecuted because she wished to become a priestess instead of marrying; she descended into hell, and hell became a heaven with gardens of lilies.

Many legends in Christendom concern the lily, and it was much used in early Christian art as a symbol of purity. At Easter it is still used to commemorate the risen Christ, and angels are often pictured as bearing lilies. There is a tradition that the lily sprang from the repentant tears of Eve falling as she was driven out of the Garden of Eden. Many of these legends refer to the Easter lily.

Yellow day lily, lemon lily (*Hemerocallis flava* Linnaeus). Figure 10, c.—This very popular yellow day lily, reckoned as among the 50 most popular garden plants in the United States, comes from Europe and temperate Asia. It thrives in different kinds of soils but is luxuriant in damp and shady places.

The meaning of its scientific name is "beautiful by day" and "yellow." This is quite appropriate, for the beautiful orange-yellow funnel-shaped flowers close in the evening after a day's flowering and do not open again. But new buds generously supplied on the one to two-foot long stem follow one another in good succession. They blossom, also, much of the year in Honolulu, where they are liked for their graceful shape, cheerful color, and sweet, wholesome fragrance. Leaves, narrow, grasslike, grow in clusters 18 to 24 inches long by half an inch wide from roots that are bundles of fleshy tubers. At Fernhurst and at the corner of Vancouver Highway and Oahu Avenue are numbers of plants.

Day lily (*Hemerocallis fulva* Linnaeus).—One kind of day lily is not common in Honolulu. It differs from the yellow day lily in having wider leaves and brownish-orange flowers, which lack fragrance and have wavy margins on the three inner petals.

Aloe (*Aloe*, several species).—The aloes are stemless or short-stemmed, succulent plants cultivated for ornamental purposes. Their thick, pointed leaves form rosettes close to the ground or are crowded along the end of their stems. Species of several different sizes and forms are known in Honolulu, a small one with scarlet flowers on Keeaumoku Street near Heulu, larger ones on the grounds of the University of Hawaii and in Kamanele Park. With their stiffness and ruggedness they fit well into some gardens and lawns, and as their home is the African desert they grow well in direct sunlight. Flowers, red, yellow, or paler striped, rise from the heart of the leaves, hanging from a rather tall stem as a cluster of narrow tubes,

which spread slightly at the throat. One species of aloe yields the "bitter aloes" of commerce, a resinous laxative juice, which was known to the Greeks as long ago as the fourth century B. C.

The Galla race of Africa believe that when the aloe sprouts the dead have been admitted to the realm of Wak, the creator. In Africa and Egypt aloe is hung over the houses to drive away evil and to bring good luck, and probably for the same reason it is planted in their cemeteries.

Agapanthus, African lily, lily of the Nile (*Agapanthus umbellatus* L'Heritier).—During its flowering season the beautiful agapanthus appears in florists' shops and can also be found in some gardens. It likes considerable water. From an underground tuber the plant rises about two feet high and consists of a rosette of long, narrow leaves and a long flower stem with many small blue flowers clustered around the top. Some varieties have white flowers.—In florists' shops; Japanese gardens in upper Manoa Valley.

Leaves.—Many, narrow, thick, about 2 feet long. *Flowers*.—Stem 2-3 feet long, simple, ending in 2-bracted umbel of 20-50 blue flowers; perianth with 6 wide-spreading nearly regular divisions, funnel shaped, tube short. *Fruit*.—Pod many-seeded; seeds flat, winged above. *Home*.—South Africa.

Spanish bayonet, yucca (*Yucca gloriosa* Linnaeus).—Formerly commonly but now rarely, the yucca is cultivated in Honolulu and in other parts of Oahu. Ordinarily on the summit of a slender or medium-sized trunk 10 to 15 feet high (rarely quite short), it bears a thick crown of long, narrow leaves, and in the fall, at intervals of several years, it is said, the plant has a handsome, white, compound inflorescence, opening at night. This yucca or a close relative is called "our Lord's candles." In its native land, pollination is effected by a white moth, in other places artificially. This is the first kind of yucca cultivated in the United States, where most of the species are native, and many different forms of it have been produced.—Fernhurst.

Leaves.—Many in a thick crown, long and narrow, 1-2 inches wide, thin, not recurved, somewhat concave, glaucous when young, sharp pointed, brown margined, evergreen. *Flowers*.—Panicle with ascending branches, short peduncled, white or with reddish or brownish shading, nocturnal. *Home*.—Carolina coast region, North America.

Ti (*Cordyline terminalis* Kunth). Figure 10, *a*.—The ti has always played an important role in the life of the Hawaiians. The leaves (*laki* or *la'i*) were made into whistles and thatched into rain-

coats, in recent times made into hula skirts; they served as plates or as wrappers for food, and also as fodder for horses and cattle; from the tuberous root a drink (*okolchao*) is made.



FIGURE 10.—Lily family: *a*, ti (*Cordyline terminalis*); *b*, asparagus ferns (*Asparagus plumosus*, above; *A. sprengeri*, below); *c*, yellow day lily (*Hemerocallis flava*), leaves and flower. Sansevieria family: *d*, bowstring hemp (*Sansevieria zeylanica*), leaves and flowering stem.

Formerly the root was used as a food in time of famine. The stems are sometimes cut into short lengths and set in water. Roots develop and leaves sprout, making an attractive table decoration. A hedge of the plant around a house is said to insure the inmates from disturbance by evil spirits and to bring good luck. The use of stem and leaves as a fan or fly-brush is said to have been the origin of the Hawaiian kahili, or feather standard of royalty.

The ti was an emblem of divine power, and the Hawaiian priests often wore a leaf of it around their necks. A gory Polynesian story tells of Hina, who used to garland herself with ti leaves; but even their protective power could not save her lover from being eaten by her ogress mother. A Hawaiian hero tale is concerned with a toy canoe made from the leaf of a ti plant, which was used by the king of Kauai to decide which of his five sons should go in search of their eldest brother. Kila, the youngest, sailed his canoe between his father's thighs, and so it was decided that he was to go in search of his brother. It is said that in the old days a shark lived in the Waipio stream. Before a man would dare to swim across, he would throw in a ti stalk. If the stalk disappeared, the shark was there, but if it floated down stream, the man would dare to plunge in and swim swiftly across.

The ti reaches as great a height as 12 feet and consists ordinarily of an unbranched stem ringed with leaf scars and of a cluster of leaves at the top. The leaves, a foot or two long and quite broad, are smooth and shining, and from their center rises a tall much branched stem bearing many small pinkish flowers. From them a small yellow or red berry develops.

This plant is found throughout Polynesia and in China, and in Hawaii it is common at the lower edge of forests.—Grounds of the Royal Hawaiian hotel; King Street opposite Thomas Square.

Varieties have purple and scarlet and rust-colored leaves. Melanesian soldiers believe that the red leaves worn around their necks make them invulnerable.

Leaves.—Smooth, shining, rather thick, 1-2 feet by 3 1/2-4 inches, broadest at middle, veins longitudinal; stems 2-6 inches long and deeply channeled. *Flowers*.—In panicle about 1 foot long with alternate branches 5-6 inches long; flowers without stems, small, many, with 3 bracts, tubular, perianth 1/3-1/2 inch long, split half way down into 6 equal lobes, which are bent back, white, outer ones purplish, lilac, or reddish, the 6 stamens and style as long as perianth. *Fruit*.—Berry, yellow or red, round, 1/4 inch in diameter. *Home*.—Tropical Asia, Australia.

Dracaena (*Dracaena*, a few species).—As the dried juice of dracaenas was supposed to resemble dragon's blood the name "dracaena," meaning "she-dragon," was given to this woody treelike lily of the Tropics. At the top of its stem are crowded sword-shaped leaves, which in one species are white with a green stripe down the center, in another species green striped with red. Greenish or yellowish

flowers are clustered in heads and later become berries. Few draecenas are growing in Honolulu.—Corner of School Street and Nuuanu Avenue; grounds of School of Religion adjoining Mission Memorial Hall.

In the mountains on all the islands a native species, *halapepe* (*D. aurea*), is rather common. It has clusters of yellow berries.

Leaves.—Crowded at the ends of branches, linear or lanceolate, closely grooved, in some species striped with green and white or green and red; in *D. victoria* broad, recurved, 2-4 feet long, white with green stripe down center. *Flowers*.—In terminal leafy panicle, greenish or yellowish-white, similar to those of *Cordyline* but larger and lobes of perianth 1-veined (in *Cordyline* 3-5 veined). *Stamens*.—Six. *Fruit*.—Berry, 3-celled, ovules solitary in each cell (in *Cordyline* many in each cell). *Home*.—India and tropical Africa and adjacent islands, Polynesia.

Asparagus fern (*Asparagus plumosus* Baker). Figure 10, *b*.—Under suitable conditions, as in greenhouses, the asparagus fern is known to climb as high as 15 feet; but in Honolulu, where it lives in pots indoors or in hanging baskets, it is stunted. This fernlike plant is a favorite in houses and is one of the commonest so used due to the elegance of its branches, which spread gracefully in flat layers and bear thick clusters of short, threadlike branches, which function as leaves.—In pots or hanging baskets on porches.

Leaves.—Lacking. *Cladophylla*.—Modified branches functioning as leaves, filiform, short, bright-green, clustered. *Flowers*.—White, commonly solitary. *Fruit*.—Berries, black, nearly round, 1-seeded; propagation by seeds and tubers. *Home*.—South Africa.

Asparagus fern, emerald feather (*Asparagus sprengeri* Regel). Figure 10, *b*.—A coarse asparagus fern is common in Honolulu in hanging baskets. Long stems, bearing open clusters of shiny, green, needle-like branchlets, which serve as leaves, droop gracefully and hang in slender strands from their support. They spring from conspicuous white tubers, which divide and produce new plants, as also do seeds and cuttings.—In pots or hanging baskets on many porches.

Florists use extensively the graceful filmy branches of mature plants of the edible asparagus (*A. officinalis*).

Leaves.—Lacking. *Cladophylla*.—Modified branches functioning as leaves, narrow, flat, needlelike, 3-4 in each whorl, glossy, green, 1 inch long. *Flowers*.—Small, whitish, fragrant, in short racemes. *Fruit*.—Berry, small, coral-red. *Home*.—Southeastern Africa.

SANSEVIERIA FAMILY

(Haemodoraceae)

Bow-string hemp (*Sansevieria zeylanica* Willdenow). Figure 10, d.—Though a highly ornamental plant, the utility only of the bow-string hemp is evident in its name. In India it is cultivated for its fiber, an acre yielding a ton, and it is woven into fine mats and made into twine and bowstrings. The quality of the fiber is excellent, being white, strong, elastic. The sacred thread of the Hindus was made of it. In India the plants grow as high as 5 feet, but in Honolulu, where they are used decoratively indoors and outdoors, they are shorter. They are stemless, the leaves rising directly from the root. When from the cluster of 8 to 15 sword-shaped leaves, marked transversely with grayish-white, a long stalk rises bearing whitish-green flowers, the bow-string hemp is particularly attractive.—Grounds of University of Hawaii; corner of Oahu and Kaala avenues.

Leaves.—Sword shaped, 1-3 feet long, in a cluster or rosette, 8-15 in a cluster, semi-cylindrical or flat, radical, fleshy, firm, interior fibrous, marked transversely with grayish-white. *Flowers*.—In a simple scape that is longer than leaves, clustered, whitish-green, 1 1/2 inches long, perianth tube narrow. *Home*.—Ceylon.

AMARYLLIS FAMILY

(Amaryllidaceae)

Zephyr flower, fairy lily (*Zephyranthes*, several species). Figure 11, c.—“Flower of the wind” is the translation of the Greek name of *Zephyranthes*, a dainty little flowering plant from warm parts of America. From bulbs, long narrow leaves develop at the same time as the long-stemmed flowers, each of which after rising six inches or higher spreads its six lobes widely. Of the four kinds known in Honolulu, two are common, two are rare. They range in color from white to pink to yellow and in diameter from one to three inches. Many black flat seeds form.

Spider lily, crinum (*Crinum asiaticum* Linnaeus).—From the center of a cluster of 20 to 30 long leaves the flower stalk of one kind of crinum rises as high as two feet and then divides into 20 or 50 short stalks, each of which bears a sweet-scented flower, white in color, varieties tinged with red. The spider-like flower

consists of a narrow tube tinged with green, from which spread six long, narrow segments and six slender red-stemmed stamens. The crinum is a common plant on lawns in Honolulu, and several varieties of this species grow here.—In gardens.



FIGURE 11.—Iris family: *a*, montbretia (*Tritonia* sp.), flowering stem. Amaryllis family; *b*, sisal (*Agave rigida*); *c*, pink zephyr flower (*Zephyranthes* sp.), leaf and flowers; *d*, amaryllis (*Curculigo recurvata*).

Bulb.—Four to 5 inches thick, neck 6-9 inches long. *Leaves*.—Twenty to 30 to a bulb, 3-4 feet by 3-4 inches. *Flowers*.—Peduncle 1 1/2 feet long, 1 inch thick, scented, 20-50 in an umbel, spathe valves 2-4 inches long, pedicels 1/2-1 inch long, white; tube erect and tinged with green, 3-4 inches long; segments 2 1/2-3 inches long. *Stamens*.—Filaments tinged with red, two inches long. *Home*.—Tropical Asia.

Spider lily (*Crinum giganteum* Andrews).—A kind of spider lily, from South Africa, has fewer leaves than *Crinum asiaticum*

(12 or more), fewer flowers (4 to 12), a longer tube, and more fragrance. The bulb is larger (five to six inches thick).

A third species (*Crinum pedunculatum*), from Australia, resembles *C. asiaticum* in number of leaves and flowers, and in size of bulb. But the separate flower stalks are longer, and the flowers are greenish-white and have short, bright-red stamens. Other species of crinum not identified are growing in Honolulu.

Spider lily, sea daffodil (*Hymenocallis*, one or more species).—The hymenocallis bears flowers like those of the pancratium. Differences, however, can be found in the seeds, most of which are alone in a cell, are large, and have a thick, green, spongy coat. Also, the two kinds of plants come from different parts of the world, except for one species from Africa the hymenocallis being of American origin. The name means "beautiful membrane," referring to the central cup.—In gardens.

Leaves.—Oblong or strap shaped, similar to those of *Crinum*. *Flowers*.—White or yellow, fragrant, umbellate, perianth with cylindrical tube and equal linear or lanceolate segments; similar to those of *Crinum* except for staminal cup; flower stem solid, flattened, arising from a bulb. *Stamens*.—Six, filaments free above but webbed and united into a cup below having the same texture as the petals, anthers narrow and movable. *Pistil*.—Ovary 3-loculed with 2 ovules each; style long and slender; stigma capitate. *Fruit*.—Seeds mostly alone in each cell, large; coat thick. *Home*.—America except one species from Africa.

Spider or spirit lily (*Pancratium*, several species).—An attractive bulbous plant from the Old World, one of the so-called "spider lilies," which is really an amaryllis, resembles the crinum in general appearance. But by their flowers they can be distinguished. Both have white flowers with long, curved petals; but the pancratium is provided with a central fringed or toothed cup of the same material as the petals, which bears stamens. Several species are known, and these vary in form of flower, the cup and petals and stamens varying in length. Many black, angled seeds develop in the cells. The name "pancratium" is Latin for "all-powerful," referring to the plant's alleged medicinal value.

Barbados lily, knight's star lily (*Hippeastrum equestre* Herbert).—Many gardens in Honolulu are now and then brightened by large showy flowers of an amaryllis called "Barbados lily." From a brown-scaled bulb two inches in diameter first rises a stout,

hollow stem about a foot high, at the top of which bloom two, three, or four bright-red funnel-shaped flowers with green centers. Not until the flowers wither do the long leaves develop fully, six to eight in number. From both seeds and bulbs new plants grow.—In gardens.

Leaves.—Six to eight, 12-20 inches by about 2 inches, narrowed to the point. *Flowers*.—Bright-red with green center, 4-5 inches in diameter; two to four on a stout, hollow, leafless, glaucous scape 1-2 feet long; segments erect, spreading, equal or 3 inner ones narrower than 3 outer. *Stamens*.—Filaments six, distinct, shorter than perianth. *Home*.—Tropical America.

Century plant (*Agave americana* Linnaeus). Plate IV.—The name "century plant" was given to that dweller in hot deserts because in the Temperate Zone and under cultivation flowers are seldom seen and at one time were supposed to appear once in a hundred years. It has a large rosette shape, consisting of several huge leaves, which are straight or curved back at the tip and extend stiffly and obliquely from a stem that is short or almost lacking. In some forms the leaves are striped green and white, in others bordered with yellow. Though not common in Honolulu, here and there in parks and on lawns the century plant is seen. In parts of the United States it is kept in tubs, which are placed outdoors in summer.—Thomas Square.

Leaves.—In close rosette, 40-50, stiff, pointed, more or less fleshy, straight or with recurved tips, several feet long, narrow, persisting year after year, margin scalloped between sharp teeth. *Flowers*.—In compact clusters near ends of horizontal branches, yellow, 3 inches long, six-parted, more or less funnel shaped. *Stamens*.—Six. *Fruit*.—Many flat, thin, triangular, black seeds. *Home*.—Tropical America.

Sisal, maguey (*Agave rigida* Miller). Figure 11, *b*.—Sisal is so named because it was first exported through the port of Sisal, Yucatan. In 1893, 20,000 plants were introduced to Hawaii from Florida and tried out at Ewa, Oahu. It thrived there and on all the islands of the group, and in 1912, 2,000 acres were under cultivation and several companies established. But as other crops are more profitable in Hawaii the sisal industry is not increasing. The plant will grow on dry, manganiferous soil, where pineapples perish.

Hawaiian sisal is of the best quality for binder twine for grain. As the waste is high in mineral plant food, it is good for fertilizer, and when fresh is good stock feed. The cleaned, dried fiber prepared from the leaves (to the amount of 500 pounds an acre and 50

pounds from 1,000 leaves) is a beautiful product, when pure and unkinked suggesting voluminous masses of light silky hair. It is called "sisal hemp" or "jeniquen." Of the two varieties in Hawaii, one is whitish, the other has a greenish cast. In Central America besides making ropes of the fiber it is used for stringed musical instruments, the saponin content is helpful in washing, the juice is an insecticide, and the leaves are fodder for cattle. In Mexico it has been cultivated for many centuries.

The plant looks somewhat like the century plant—a huge rosette of long thick stiff leaves, with stem absent or up to four feet long. In three or four years the base leaves are mature, and for 15 to 20 years 12 to 23 leaves are yielded yearly by one plant. In six or nine years, flowering poles rise as high as 15 feet from the center of the leaves. The great amount of sap flowing upward in this stem is collected in Central America by cutting out the central bud and leaves, and an alcoholic drink, called pulque, is prepared from it.—Along the road to Makiki, behind Punchbowl.

Mexican tradition tells of the curse of the maguey. A wicked old man cut down a maguey, and from it sprang an evil spirit, who told him to take the milk from the stalks, distill a liquor, and send it to the king by his lovely daughter. The king married the daughter, who was not happy until her baby was born and then not for long, for the king saw on the child's shoulder the mark of the maguey. As he had been warned in a dream "to beware the son of the maguey," he sent the baby away to be killed. But the evil spirit protected the child, who grew up to kill his father with the approval of his mother. Even to this day the drink, pulque, is a curse to Mexico, and it is said that the spirit of the unhappy queen will wander over Mexico until the drink goes from the land.

Leaves.—Pale-green, 4-6 feet by 4-5 1/2 inches, most smooth edged, some with stout sharp teeth, terminal spine stout and purplish-black. *Flowers.*—Scape 12-30 feet by 4-6 inches with panicle as large as 8 feet by 4 feet and composed of 30-40 branches, pale yellowish-green. *Fruit.*—Capsule, rare; bulbils to the number of 2,000 on each pole. *Home.*—Southern Mexico.

Amaryllis (*Curculigo recurvata* Aiton). Figure 11, *d.*—A common garden plant in Honolulu and in some other warm places, as Ceylon, a kind of amaryllis, is grown chiefly for its foliage. In temperate North America florists keep it in jardinières during the winter and for the summer transfer it outdoors. It looks like a

young palm, a cluster of long, plated leaves rising a yard or more above the ground, over which they arch and where if the air is moving even slightly they sway from side to side. The roots are tuberous and love to be near water. In season, yellow flowers hang in a drooping head. Instead of from the seeds that form, new plants commonly grow from new tubers.—Fernhurst.

Leaves.—Rising from the root, 1-3 feet long, 2-6 inches wide; blade lanceolate, recurved, plated, arching; stem channeled, a third or a quarter the length; varieties have 1 or more bands of white on the blades. *Flowers*.—Yellow, in a drooping head, about $\frac{3}{4}$ inch across; bracts 1 to each flower and about as long; stems about as long as leaf stalks, covered with long, soft, brown, recurved hairs. *Fruit*.—Succulent, indehiscent; seeds nearly round, black. *Home*.—Tropical Asia, Australia.

Yam, hoi (*Dioscorea bulbifera*). Yam family. See page 306.

IRIS FAMILY

(Iridaceae)

Moraea (*Moraea iridioides* Linnaeus).—While the iris is a native of the Northern Hemisphere, the moraea, a close relative, is a native of Africa. Though similar in most ways, the iris is harder and grows from a less compact bulb. On stems one to two feet high, bearing many short sheathing bracts and surrounded at the base by a rosette of a few long leaves, rise the iris-like flowers of the moraea. They are blue and are marked with white and yellow. They last only a day or two.—In gardens.

Leaves.—Long, narrow, in fan-shaped basal rosettes. *Flowers*.—White, 6-parted, more than 3 inches across, marked yellow on claws of 3 outer segments, no perianth tube (present in most irises). *Stamens*.—Ordinarily united (free in iris). *Pistil*.—Style crests marked with blue. *Home*.—Africa.

Blue flag (*Iris*, several species).—In a few gardens in Honolulu blue flags grow. They are similar to moraea; but the six flowering parts are joined more closely. The three outer parts of the flower are bent back as in moraea, the three inner are ordinarily smaller and erect. In color many are deep-blue, many lighter.

Japanese legend tells of a time of famine when the emperor ordered that ornamental plants be uprooted from the gardens and food plants substituted. As the iris was used in making a face powder the women planted it on the roofs, and to this day iris as well as other plants bloom on roofs in Japan. A blue flag called *shobu* is the flower of Boy Day, May 5th, which the Japanese cele-

brate. The *shobu* is believed to be a protection against evil spirits, and for that reason its leaves are hung from the eaves of houses and are also put into bath water.

Leopard lily, blackberry lily, pardanthus (*Belamcanda chinensis* Leman).—In the United States, the leopard lily has long been a popular garden plant, and in Honolulu it has become fairly common. About six long, narrow leaves form a loose clump, which rises a yard high or less and bears large, open flowers, orange spotted with red. The fruit is an attractive decoration, black, shining seeds forming in clusters that suggest blackberries, and are said sometimes to be mistaken for them by birds.—In some gardens.

Leaves.—About six in a lax tuft, bases overlapping, striate, 1-1 1/2 feet by 1 inch broad. *Flowers*.—Orange, spotted with red; perianth segments oblong, the 3 inner slightly shorter than 3 outer and spirally twisting as they fade; outer spathe valves 1/2-1 inch long; pedicels 1-2 inches long. *Fruit*.—Clusters of black, shining, roundish seeds. *Home*.—China.

Montbretia (*Tritonia* species). Figure 11, *a*.—The montbretia is a hardy plant that thrives in warm Honolulu and, if protected, survives New York winters. From the midst of narrow leaves a stem rises in flowering season a foot long or more and bears several rather small but exceptionally showy flowers that are yellow, orange, or red, and consist of a tube terminating in six spreading lobes.—In several gardens.

Leaves.—Several, stiff, linear. *Flowers*.—Several to many, on stem rising above leaves; yellow, orange, or red; tubular, with spreading limb divided into six oblong, nearly equal segments. *Stamens*.—Inserted on perianth tube, 3, with mostly versatile anthers and filiform filaments. *Pistil*.—Style filiform, 3-branched. *Fruit*.—Capsule with 3 valves. *Home*.—South Africa.

BANANA FAMILY

(Musaceae)

Traveller's palm, traveller's tree (*Ravenea madagascariensis* J. F. Gmelin). Figure 12, *a*.—The traveller's palm, wrongly so called, as it is not a palm but a relative of the bananas, is an ornamental, strange-looking tree seldom growing very high in Honolulu, though in other countries, possibly in its home in Madagascar, it sometimes reaches a height of 50 feet.

From a palmlike trunk spreads a huge fan-shaped crown, about

15 feet in length, consisting of long, thick stems, packed neatly together in one plane on opposite sides of the trunk. To the stem is attached a broad blade like that of the banana leaf, less than half as long as the stem. In older plants, the leaves though made ragged by the wind are still beautiful. The bases of the concave leaf stems store water and can be tapped by thirsty travellers. As a matter of fact, the tree is usually found only where water is plentiful. In Madagascar the leaves are used for roofs and packing, the leaf stalks for thatching.—Fernhurst; corner Punahou and Beretania streets; Capitol grounds.

Leaves.—Crowded at top of trunk in a huge fan shape, 2-ranked, as long as 15 feet, blade like that of banana leaf and less than half as long as stem. *Flowers*.—In spathes about 7 inches long, white, many. *Fruit*.—A 3-valved capsule containing seeds surrounded by a bright-blue fibrous covering. *Home*.—Madagascar.

Bird-of-paradise flower (*Strelitzia reginae* Banks). Plate XXI. —The bird-of-paradise plant is famous for its elegant and strange-looking flowers. The floral stem rises higher than the leaves and bears a sheath half a foot long, divided into about six parts and spreading nearly horizontally. While the sheath is purplish at the base, the somewhat bird-shaped flowers are orange and blue-purple. The plant grows three feet high, is nearly stemless, all leaf stalks springing from the base of the plant, and has strong, large roots. The leaves are oblong and large and have stalks two or three times as long as the leaves. The plant is rare in Honolulu. It was named *Strelitzia* after the wife of King George III, Charlotte Sophia, of the family Mecklinburgh-Strelitz, who was a patron of botany.—In a few gardens.

Leaves.—About 1 foot long, stiff, concave, oblong; stalks 2-3 times as long as blade, growing from base of plant. *Flowers*.—Spathe about 6 inches long, nearly horizontal, purplish at base; about 6-fid, orange and blue-purple; stem springing from near base of plant and rising higher than the leaves. *Home*.—South Africa.

Brazilian or common banana (*Musa sapientum* Linnaeus).—Compared with the Chinese banana, the Brazilian is a much larger plant, being 20 to 30 feet high and having a diameter of 4 to 6 inches. It is cultivated in all tropical countries for its good fruit, sometimes for fiber. In some lands it will grow up to elevations of 4,000 feet. About half as many plants grow on an acre as of

the Chinese kind. Many varieties are known, among them the locally popular apple banana, the fruit of which has a whiter, more acid, and stiffer pulp than the Chinese banana.—Mostly on plantations.

Leaves.—Oblong, thin, bright-green, 4-7 by 1 1/2-2 inches; stem slender, 1-1 1/2 feet long. *Flowers*.—Panicle 3-5 feet long; each flower 1 1/2 inches long, yellowish-white, in clusters alternating with large, red, succulent scales; petal half as long as calyx; male flowers deciduous. *Fruit*.—In 3-4 bundles of about 12 each, 3-4 by 1 1/2-2 inches, rounded above, narrowed to a sessile base, bright-yellow; pulp creamy, nutritious, easily digested. *Home*.—Tropical Asia.

Red banana (Spanish or Jamaica), Baracoa banana, maia (*Musa sapientum* Linnaeus var. *rubra* Hortorum).—The Jamaica banana one of the chief bananas of American trade, was brought to Hawaii in 1903. The plant is large and decorative, and beautiful, erect leaves spring from a trunk that is dull-red in color, as are also stem and midrib of the leaves. Flowers and fruit are dull-red, too, the fruit ripening from red to yellowish-red. The bananas are seven to nine inches long, of good quality and flavor, and they ship well.

Banana, maia, plantain (*Musa sapientum* Linnaeus, several varieties).—When Hawaii was discovered by the white man, the natives had about 50 varieties of bananas, which came with them on their migrations and formed an important item in their diet. Descendants of these trees are growing apparently wild in Hawaii today, some deep in the valleys, some in gullies well up on mountain slopes, where they were formerly planted. Others are cultivated in more accessible places and their fruit sold in the market, among them an excellent kind of cooking banana.

One kind of wild Hawaiian banana (*Musa fchi*) often functioned in religious ceremonies in early times in Tahiti, the trunk representing a man and serving as a substitute for him in sacrifices. Bunches of fruit of this kind of banana are held on an erect stem, as also are those of a few other kinds in Hawaii. The fruit-bearing stem on most kinds bends downwards. Legend says that long ago all bananas bore their fruit on upright stems like the *fchi*, the mountain banana. The lowland and mountain bananas quarreled and fought. The lowlanders were defeated, and to this day they hang their heads in shame.

Chinese banana, dwarf banana, plantain (*Musa cavendishii* Lambert). Plate XX.—Of the many kinds of bananas raised in Hawaii, the Chinese banana is the commonest and is the only one raised on a commercial scale. In 1855 it was brought from Tahiti, and it grew so successfully that in less than ten years 121 bunches had been exported. In 1896, the amount was increased to 126,413—about the most ever shipped. In a bunch, 200 to 300 fruits are borne. In the trade, nine hands make a bunch, eight hands three-quarters of a bunch, seven hands half a bunch. As 800 plants grow on an acre it is evident that the crop is extraordinarily large—the largest kind known. The yield of wheat an acre is about 1620 pounds, of bananas 32,000 pounds and nearly four times as many calories. For shipping they are packed in dried leaves.

The Chinese banana tree is small and stocky, growing rapidly to a height of four to seven feet. The trunk, which consists of the thick leaf stalk, is green and tapers upwards from a base about four inches in diameter to a heavy crown of arching, broad-bladed leaves—making a graceful plant, which accounts for its common use ornamentally. If growing near sea level, this banana fruits when 12 months old. It needs nearly as much water as sugar cane and likes exposed places at low elevations, but it needs protection from exceptionally strong winds, which not only do a little injury by tearing the leaves but also blow whole plants over. After fruiting, the trunk is cut down and new plants sprout from the base. New plantations are started from these young plants, from large suckers six to eight months old, and from small offshoots two months old. Planting is done at all seasons; but spring is the best time.

Flowers are borne on a large stalk that comes from the midst of the leaves and ends in a budlike tip—purplish-red scales, which drop off as the flowers beneath each one begin to develop into fruit. The banana is an important food, rich in carbohydrates and richest in proteins of any fruit, in many countries being used for a dessert, for a main dish in the south Pacific islands. It is also dried and made into a flour for use by invalids and infants (as is also the cooking banana). Alcohol, vinegar, and wine are other products. The leaves contain a useful fiber and make good bandages, the young leaves a vegetable; flowers, fruit, and root are medicinal; the sap is used as a dye; the ashes, in India, are used for dyeing, tanning, curries, and in place of salt. In the trunk is a fiber con-

sisting of two per cent of the plant, which is half as valuable as Manila hemp, the product or another species of banana (*Musa textilis* or *M. mindanensis*) not so well known in Hawaii and distinguishable by its unpalatable fruit containing black seeds. But the fiber is not often saved.

Several varieties grow in Hawaii. In the West Indies, Jamaica, and the coast of southern United States many bananas are produced. The general terms "plantain" and "banana" cannot always be distinguished. "Plantain" is applied to large, coarse kinds used for cooking, "banana" to sweet sorts eaten raw; but as the same kinds are eaten either raw or cooked, such a distinction cannot always be made.—Mostly outside the city, as in plantations at Kaneohe and Waialua.

Leaves.—Flat, entire until made ragged by wind, oblong, 2-3 feet by 1 foot, gracefully spreading, pinnately parallel veined, young blade spotted with red and in age rather white; petioles short and stout, forming a false stemlike structure; juice stains clothing dark. *Flowers*.—In a large panicle on a large stalk coming from the midst of the leaves, bending down, and ending in a large bud shape made up of purplish-red scales or bracts, each one of which partly encircles each row of flowers and drops off as fruit ripens, stains clothing; some flowers perfect, some not, female flowers open first, male later; 1 inch long, in 6 parts, 5 united (calyx), 1 petal, 5 perfect stamens. *Fruit*.—In clusters, like many fingers, prolific—as many as 300 fruits on 1 spike, 4-5 by 1 1/2 inches or larger, yellow, 6-angled, slightly curved, blunt, narrowing to stemless base; skin thick; pulp cream-colored, solid, soft, sweet, fragrant, nutritious, ripening in 18 months; seeds rudimentary. *Home*.—Southern China.

Early names of the banana were "fruit of paradise" and "fruit of knowledge." It was believed that the banana plant was the source of good and evil and that the serpent was hiding in a bunch of bananas before he tempted Eve. According to Tahitian legend the stem upon which the flower grows sprang from the windpipe of man. In parts of Polynesia, young banana trees were used as flags of truce. In Mangaia the twisting of banana leaves was said to foretell cyclones. In Sumatra it is said that a god who was sent to earth to finish creation should have fasted or eaten crab; but he ate bananas and therefore man's life is short like that of the banana instead of ever renewing like that of the crab, which every year has a new shell. A Hawaiian proverb shows a similar thought: "Man is like a banana the day it bears fruit"; that is, he dies after his work is done. According to Hawaiian legend, a brother of Pele, goddess of volcanoes, brought the banana to Hawaii. In Hawaii



PLATE XX. CHINESE BANANA (*MUSA CAVENDISHII*).



PLATE XXI. BIRD-OF-PARADISE FLOWER (*STRELITZIA REGINAE*),
PHOTOGRAPH BY A. R. WADSWORTH.

it was believed to be bad luck to dream of bananas or to meet a person carrying them, and to carry bananas as part of lunch on a fishing trip is said to bring bad luck. In sacrifices to the gods, a banana stalk was sometimes used as a substitute for a human sacrifice both in Hawaii and Tahiti.



FIGURE 12.—Banana family: *a*, traveller's tree (*Ravenala madagascariensis*); *b*, heliconia (*Heliconia* sp.), leaves and flowering stem.

Until the tapu was broken in 1819, at the beginning of the reign of Liholiho, some kinds of bananas were among several kinds of food forbidden to women, death being the penalty for disobedience. When Kalakaua, the last king of Hawaii, died in San Francisco his body was put in a coffin and returned in state to Hawaii. The natives removed the body to another coffin and placed a banana stalk in the empty coffin, which they buried in Kawaiahao churchyard. If this had not been done, the Hawaiians believed the coffin would have called for the death of a relative. A Hawaiian belief that still lingers is that a dream of a hole in the ground is the sign of an open grave and that to offset bad luck the dreamer must plant some part of a banana.

Hawaiian literature is rich in the use of similes referring to bananas: "his skin was like a ripe banana"; "his beauty returned like the beauty of the young banana leaf"; "he tore a man to pieces as he would tear a banana leaf." It was used in proverbs too: "a cheat is a banana stem, all pith at heart."

Heliconia (*Heliconia*, several species). Figure 12, b.—*Heliconias* resemble banana plants, but are much smaller. Their stems are slender and the leaves, which rise from a strong rootstock and spread widely, are smaller and narrower than those of the banana. They are bronzy or green and drooping. Flowers grow in clusters below the leaves in sheaths colored scarlet and black or green, and a dry, three-seeded fruit forms. About a dozen kinds of this highly ornamental plant are growing in Honolulu, but are rather rare, the commonest (*H. humilis*) having red sheaths with green edges. The name *Heliconia* comes from Mt. Helicon in Greece, the seat of the Muses.—One kind on lawn of church, corner of Palama and Beretania streets; *H. humilis* at 1060 Lunalilo Street.

Leaves.—Large, bronze, drooping, 4-5 feet high. *Flowers*.—In clusters below leaves, subtended by bracts. *Calyx*.—Sepals 3, long. *Corolla*.—Short tubed. *Stamens*.—Five, staminodium 1. *Fruit*.—Dry, 3-seeded, 3-spaced. *Home*.—Tropical America.

GINGER FAMILY

(Zingiberaceae)

Yellow ginger, cream ginger (*Hedychium flavum* Roxburgh).—In damp places in low, open forests in Hawaii the yellow-flowered ginger grows wild as luxuriant green herbs a yard or two high, rising from tuberous underground stems. Very long, smooth, fine-veined leaves grow in regular formation along the stem, and in season at their summit appears a spike of many beautiful, heavily perfumed flowers—the cause of the scientific name, *Hedychium*, which means "sweet snow." The flowers are commonly threaded in leis by Hawaiians.—Wild in damp places.

Leaves.—Arranged alternately in 2 vertical rows, about 1-2 feet long, pointed, smooth, rather thin, broadly lanceolate, with many fine parallel veins forming an acute angle with a distinct midrib; stem forming a long sheath partly enclosing the stem of the plant, which runs down into the leaf sheath below and is topped by 2 ears. *Flowers*.—On a stalk about 1 foot long, com-



FIGURE 13.—Ginger family: *a*, ginger (*Zingiber zerumbet*), leaf and flowering head; *b*, kahili ginger (*Hedychium gardnerianum*), head showing a few flowers; *c*, shell ginger (*Alpinia nutans*), flowers and bud; *d*, globba? (*Globba?* sp.); *e*, white ginger (*Hedychium coronarium*), flowering head.

ing from the base of the plant, spike ovate, 3-5 inches long, its 6 or so rounded, green bracts each enclosing a flower. *Calyx*.—Thin, 3 narrow sepals as long as petals, yellow, tube about 1 1/2 inches long. *Corolla*.—Tube cylindrical, 3 narrow lobes, upper lobe broad, concave, notched, bearing a light, heart-shaped spot, lateral lobes narrower, spreading, about 3 inches in diameter, yellow. *Stamens*.—Anther, 1 2-located, on a short filament. *Pistil*.—Style slender and surrounded by filament of stamen, the small, round stigma appearing beyond the anther. *Fruit*.—Capsule oblong, not breaking regularly. *Home*.—India.

White ginger, butterfly lily, ginger lily, garland flower (*Hedychium coronarium* Koenig). Figure 13, *e*.—The white ginger differs from the yellow by having slightly different flowers and leaves. According to personal observations, the white-flowering kind has larger flowers with wider petals, shorter stamen, more delicate odor, and leaves of smaller size. This plant grows wild in damp places, as near the upper part of Tantalus road, and it is cultivated somewhat, as at 318 Iolani Avenue.

Kahili ginger (*Hedychium gardnerianum* Roscoe). Figure 13, *b*.—With stems as tall as six feet, bearing rather long leaves, which are white beneath, the kahili ginger is growing in a few gardens in Honolulu. From the ends of the stems rise large, rounded, bright-red or green heads rather closely packed with yellow flowers, from each of which projects a long red filament. The fruiting capsule is also red and attractive. The flowering head resembles a Hawaiian kahili. This ginger is considered one of the most desirable. It is highly ornamental, and it endures considerable cold, in its native Himalayas growing at elevations as great as 8,000 feet.—In a few gardens.

Leaves.—Oblong, powdery-white beneath, 1-1 1/2 feet by 4-6 inches; stem 5-6 feet long. *Flowers*.—Spike 1-1 1/2 feet long, moderately dense-flowered, sweet scented; bracts large, red or green, oblong, 1 1/2-2 inches long, smooth, 1-2 flowered, rolled tightly around flowers. *Calyx*.—Not longer than bract, tubular, 3-toothed. *Corolla*.—Tube a little longer than bract; segments bent back, 1 inch long or more, lemon-yellow; lip obovate or wedge shaped, tip 2-3 toothed, about 1 by 1/2 inch, narrowed to short claws. *Stamens*.—Staminodes oblanccolate, 1+ inch long; stamen with red filament twice as long as lip. *Fruit*.—Capsule red, round, 3-valved; valves oval and orange-red within, persistent, 3/4 inch long; seed brownish-crimson. *Home*.—Himalaya region.

Shell ginger, shell flower (*Alpinia nutans* Roscoe). Figure 13, *c*.—The highly ornamental shell ginger has long clusters of waxy-white, bell-like flowers touched with red, inside red and yellow.

They arch gracefully from the top of long-leaved, bending stems five to twelve feet high. Where the plants are growing in rows or clusters the foliage forms thick masses. The roots resemble those of ginger, multiply like them, and produce new plants.—2525 Jones Street.

Leaves.—Long, lanceolate, smooth, long-veined. *Flowers*.—In long, drooping, terminal, spikelike raceme; individuals orchid-like, waxy-white, tinted with red, 3 exterior parts, 4 interior; lowermost part scoop shaped, stiff, orange with red markings. *Stamens*.—One, with large anther and petal-like filament. *Pistil*.—Anther surrounding upper part of style, enlarged stigma extending beyond. *Home*.—East Indies.

Ginger (*Zingiber officinale* Linnaeus).—The commercial ginger is cultivated somewhat in Honolulu. It stands two to four feet high and has several long, narrow leaves. The tuberous, horizontal, underground stems multiply by division into palmate shapes. When young they are tender and succulent and in the right stage for the manufacture of candied ginger, which is made on a large scale in China, being prepared by peeling and boiling in sugar and water. Unpeeled roots are dried in the sun and shipped, and from them medicinal ginger is prepared, which is a stimulant and aromatic and is taken for indigestion, fever, etc. This plant has been introduced and cultivated in all tropical countries, the highest-priced roots coming from Jamaica. A harvest is yielded about ten months from planting, an acre yielding about 1,500 pounds of cured ginger.—In a few gardens.

Leaves.—Lanceolate, oblong, smooth, 6-13 inches long; stems clasping, long sheathed. *Flowers*.—Spike 2-3 by 1 inch, oblong, produced from rootstock on stems 1/2-1 foot long, with sheathing, scarious bracts about 1 inch long. *Calyx*.—Cylindrical, shortly 3-lobed. *Corolla*.—Tube cylindrical, 3 lanceolate segments, red. *Stamens*.—One, dark-purple. *Home*.—India and China.

Ginger, awapuhi, opuhi, beta (*Zingiber zerumbet* Roscoe). Figure 13, *a*.—In the lower parts of rather open forests in Hawaii the *awapuhi* is a common plant. It grows luxuriantly to a height of a foot or two and has large knobbed underground stems, which were formerly used by Hawaiians to scent their tapa. For though more bitter than those of the commercial ginger, the stems have a similar odor. In the season when its oblong flowering head appears, which consists of large, green-to-red, overlapping bracts and small inconspicuous yellowish flowers, the *awapuhi* is conspicuous. When

mature, the flower head is sudsy, and is said to have been used by Hawaiians for shampooing. The leaves are long, pointed, and thin and have given rise to the Hawaiian proverb: "The ginger leaf that wilts quickly," referring to the brevity of life.—Along upper Tantalus road.

Leaves.—Arranged in 2 vertical rows, 7-8 inches long, broadly lanceolate, pointed, smooth, having a sheath which runs out into 2 ears. *Flowers*.—Oval spike, 2-3 inches long, sudsy; bracts green at first, changing to red, rounded, enclosing small, pale-yellow flowers, which appear 1 or a few at a time; stalk about a foot long, coming from base, covered by about 6 oblong sheathing bracts each 2 inches long. *Calyx*.—Thin, tubular, with 3 short lobes. *Corolla*.—Cylindrical tube ending in 3 narrow lobes, yellow. *Stamens*.—Middle lobe of labellum notched, yellow; anther 1, filament short. *Pistil*.—Style slender, enclosed in filament; stigma round, extending beyond anther; ovary 3-celled. *Fruit*.—Oblong capsule breaking irregularly. *Home*.—Polynesia to India.

Torch ginger (*Phacomeria speciosa* Benthams and Hooker).—The torch ginger is a very decorative plant growing 10 or even 15 feet high. The graceful, bronzy leaves equal the plant in length; the flowers form in large, bright-red, conelike heads on stems one to three yards high. A pink-flowered torch ginger is also growing in Honolulu. Both kinds are natives of Mauritius, and neighboring regions are the homes of some closely related gingers, a few of which are said to be present in gardens here. One with red flowers is growing on a lawn on Punahou Street next to the grounds of the Central Union Church.

Ginger (*Globba?* species?). Figure 13, d.—A red-flowered ginger is commonly cultivated around houses in Honolulu, as on Liholiho Street between Wilder Avenue and Lunalilo Street. The plants grow about four feet high. Both the greenery of its long leaves and its heads of bright-red blossoms, which come out well in winter and last a long time, are attractive. The flowers, which form larger and longer spikes than *Zingiber officinale*, grow from leaf axils, and there the young plants germinate and begin to develop.

CANNA FAMILY

(Cannaceae)

Canna, Indian shot, aliipoe (*Canna indica* Linnaeus).—As the ornamental canna is spread over all the Hawaiian islands, it was

probably introduced not long after Hawaii was discovered. In some form it is found wild on roadsides here and there, mostly dwarfed and with small flowers. Some are horticultural varieties, some sports, some hybrids, which vary in color of stems and leaves (green to purple) and of flowers (pale-yellow to red). This canna is also well known in warm parts of Asia and America. The plant rises from large roots and has smooth, slender, green stems three to five feet long, which bear long leaves and scarlet or yellowish flowers in erect, loose clusters all the year. The flowers are curious because the stamens are highly colored, taking the place of petals and sepals, which are, strangely, narrow, inconspicuous parts. Inch-long, erect seed cases with a warty covering contain few to many round, black seeds, which are worn in leis by Hawaiians. Buddhists wear them in rosaries, thus explaining the meaning of "canna"—"help from Buddha."

A legend tells of an evil man who climbed a hill where Buddha was to pass and hurled a boulder at him. The boulder broke and a small piece struck Buddha on the foot. Blood trickled down and up sprang a canna. The earth opened and swallowed the evil man, who was never seen again.—Common in gardens, as at corner of Beretania and Keeaumoku streets; Makiki alley, nursery of Board of Agriculture and Forestry.

Leaves.—Lanceolate to oval to oblong or almost round, tip pointed, margins thin, 6-18 by 4-8 inches, veins arching, sheath open above. *Flowers*.—Raceme simple and lax, erect; flowers rather distant, 2-2 1/2 inches long, some in pairs, scarlet or yellow, 1 in each bract; bracts 1/2-1 inch long, oblong, thin, obtuse, green; stems 1 foot long or more, with long narrow sheath about the middle. *Calyx*.—Segments 3, about 1/4 inch long, thin, obtuse, green, erect, stiff, persistent. *Corolla*.—Segments 3, 1 inch long or more, erect, narrow, lanceolate, pointed, tips recurved, pale-green or red, united with staminodia in short tube. *Stamens*.—Segments larger than in corolla, 3 upper staminodia suberect, petal-like, bright-red, 2 inches long, narrow; lip entire, linear, red-yellow spotted with red, revolute; anther 1, borne on narrow staminodium. *Pistil*.—Style flat and joined below to staminal tube, stigma capitate, ovary 3-celled and many-ovuled. *Fruit*.—Erect capsule, 1/2-1 inch long, nearly round or oblong, obscurely 3-lobed, crowned with calyx segment, warty, black, thin; seeds many or few developing, round, with black, shining, crusty covering. *Home*.—West Indies, Guiana.

Canna, Queensland arrowroot, Australian arrowroot (*Canna edulis* Linnaeus.)—In 1898 the edible canna is believed to have been brought to Hawaii. Its succulent green and purple stems grow

four to ten feet high and bear broad, oblong, pointed leaves about half a yard long. In some countries the plant is raised for its tubers, in South America and Australia for the starch in them, in some other countries as a vegetable, being similar to white potatoes but more fibrous and not so palatable. During the war, provision was made for cultivation of canna as a food in Hawaii, if necessity should arise. Since 1922 it has been raised to obtain tops and tubers for cattle fodder. As the yields are heavy, the cost of production low, and the starch as good as potato starch, it promises to become a profitable crop. In 1927, 135 acres were devoted to it and three times as much land the next year. The yield is about 30 tons an acre. It is an advantage that it grows at higher elevations than pineapples and sugar cane. At Waimea, on the island of Hawaii, it grows six to ten feet high, and 20 to 40 stalks form at the base.—Rare, mostly on outlying farms.

Leaves.—Oblong and pointed, 1-2 feet long, green or bronzy. *Flowers.*—Red or yellow or variegated, 2-2 1/2 inches long, one in each bract, some paired; in a simple or forked, loose, erect, terminal raceme; blooming continuously, beginning when 4-6 months old; bracts round or oblong. *Calyx.*—Sepals oblong-lanceolate, thin, dry, 3, overlapping, 1/2 inch long, reddish. *Corolla.*—Petals greenish, lanceolate, 3, 1+ inch long, joined with staminodia in short tube. *Stamens.*—Substitutes for petals, 3 upper staminodia bright-red or orange, entire, 2 inches long; a fourth linear and revolute, bearing 1 anther; a fifth red-yellow, spotted with red, narrow and deflexed forming the lip of the flower. *Pistil.*—Style long, flat; stigma enlarged. *Fruit.*—Large, erect, warty capsule. *Home.*—Tropical America.

ORCHID FAMILY

(Orchidaceae)

Vanilla (*Vanilla planifolia* Andrews). Figure 14.—The vanilla is the only orchid raised on a large scale for utilitarian purposes. It is a vine, climbing several feet high on trees, poles, or trellises, zigzagging up with smooth green stems that bear at the joints thick leaves and clinging aerial roots. In order to produce seeds, the large pale-green flowers must be hand pollinated in countries where the kinds of insects are absent that are needed for this purpose. This must be done in the morning when pollen and stigmas are fresh. On Oahu fruit has been known to develop from flowers pollinated by some unknown natural means. Within a year and a

half after planting, a vine blossoms, about nine months later it bears a first small crop, and continues to bear annually for 30 to 40 years. If grown commercially, on each vine 30 to 50 of the long, narrow, podlike berries are allowed to mature. These are pricked green, cured, and after they are left to ferment for three to five weeks, vanillin, the active principle of vanilla crystallizes on the outside of the pod. About 100 pounds of cured pods are yielded on an acre. As vanilla needs a little shade, it is ordinarily a secondary or minor crop. A hot, damp climate is needed for its success, a condition that exists in Kona, Hawaii, and up to 2,000 feet in parts of Tahiti, Mexico, Reunion, Comoro, Madagascar, and the Seychelles. In those places it is grown commercially, in Honolulu as an ornament and curiosity.—In a few gardens.



FIGURE 14.—Orchid family: vanilla (*Vanilla planifolia*), leaves, podlike, berry, aerial roots.

Leaves.—Alternate, elliptical or ovate, long pointed, thick and fleshy, short stemmed, veins and midrib not evident. *Flowers*.—Pale-green, in short axillary clusters; sepals and petals similar, spreading, funnel shaped, linear-oblong; lip erect and adnate to sides of column, column long and narrow and hairy in front, limb enveloping upper part of column. *Fruit*.—Podlike berry, narrow, 5-6 inches long, ripe when yellowing at ends, up to 50 berries on one vine; seeds minute, black, numerous. *Home*.—Mexico.

Among many orchids grown in gardens of Honolulu for their strange and beautiful flowers are species of *Dendrobium* from the tropical Eastern Hemisphere, *Cattelya* and *Laelia* from tropical America, and *Phalaenopsis* from the Malay Archipelago and India. The Maoris of New Zealand say that the orchid did not have its origin in or from the earth, but was created by the gods.

BEEFWOOD FAMILY

(Casuarinaceae)

Ironwood, she oak, beefwood, toa (*Casuarina equisetifolia* Linnaeus). Figure 15.—“Gray, rugged, and sad; out of place in the wanton Tropics” is the way W. Somerset Maugham, in his book, “The casuarina tree,” describes the ironwood, which is a native of warm southern Pacific lands and islands. It is a distinct kind of tree not closely related to any other plant. Its long, slender, drooping, dull-green needles are fringy like the feathers of a cassowary (*Casuarius*), and the tree suitably bears a similar name. The flowers are often abundant in May and June. The seeding and pollen-bearing kinds are separate individuals on the same tree, the pollen-bearing flowers being long, brown cylinders slightly larger than the needles, from the tips of which they hang. The seeding flowers appear at the base of the needles as small, red tufts, and they form round, green cones that ripen into brown cones nearly an inch long.



FIGURE 15.—Beefwood family: ironwood (*Casuarina equisetifolia*), needle-like branches and female cones.

The tree grows large and tall and rapidly near the sea and is known to reach a height of more than 100 feet, the remarkable growth rate of one being 80 feet in ten years. It will also grow inland. The ironwood is very useful as a windbreak, as a barrier

to sand, and as a shade tree; but it takes so much nutrition from the soil that few plants can grow near it. Its wood, which is red like beef and hard, has many uses, being good fuel, in Fiji serving for tapa beaters, in Australia and Samoa for war clubs. In all the arts in the south Pacific it takes the place of the koa. The bark, gray and furrowed on the outside, is used for tanning and dyeing and also in medicine as an astringent.

To this tree are attributed mysterious powers. It is said that storms and unfavorable winds will accompany those who take a piece of the wood with them in a boat and also that in the shadow of the tree at full moon secrets of the future can be heard. Throughout southern Polynesia the ironwood is known as "the warrior tree" (toa). Tahitians claim it sprang from the body of warriors, whose blood became the red sap, their hair, the leaves. According to legend, the first ironwood of Mangaia came from Tonga, where weapons were made of it. Oarangi alone of all Mangaians dared to touch the demon tree, and he was driven by ambition to conquer his fellow chiefs. The tree was felled at night; but it reerected itself. Two of the men who cut it spat blood of the color of its inner bark, and they died and were left unburied in the tall ferns. Again Oarangi tried to fell the tree, but he and all his men died. When Ono of Tonga heard of the failure he came with his magic spade and dug carefully, exposing the tap root. With a mighty blow he cut the tap root in two and out popped the head of a demon. With another terrific blow he split the skull of the demon. To this day Mangaians will tell you that their groves of ironwood sprang from the chips made by Ono's magic spade.

Fijian legend tells of the sky-child whose ironwood staff grew in one night into a tree that reached heaven. He climbed to the sky and helped his father conquer his enemies, then he returned to earth and married the serpent god's daughter.

Today finds the warrior tree being metamorphized into a symbol of faithfulness. The Japanese of Hawaii, lacking the pine of their country, sometimes use the ironwood branches as gateway decorations in their New Year's festival in commemoration of Matsue and Teoyo, whose love under the pines increased with the years.—Bordering Kalakaua Avenue at Kapiolani Park.

Leaves.—Reduced to whorled scales. *Branches*.—Functioning as leaves; needle-like clusters, dull-green, slender, 6-8 jointed, hanging from tips of

woody branches. *Flowers*.—Sexes separate on the same tree; male: at tips of needle-like branches, brownish, cylindrical spikes, long, slightly larger than the branches, each having a stamen and 4 scales; female: at base of needle-like branches, small, red tufts; short-stemmed. *Fruit*.—Green and round at first, when ripe brown, stiff, oblong or round cone, about $\frac{3}{4}$ inch in diameter; nutlets, winged, 50-60, light (96,000 to a pound). *Home*.—Malaysia, South Pacific islands.

Long-leaved ironwood, she oak, beefwood (*Casuarina quadrivalvis* Labillardiere).—An ironwood from southeastern Australia prefers uplands and does not grow so tall as its lowland relative, from which it can be distinguished by its longer needle-like branches. It differs also in having suckers that rise from the roots and form clumps of trees. It is said that cattle eat the needles. Many ironwoods of this kind are growing by the road leading to the Pali, a few at the corner of Rocky Hill Street and Vancouver Highway.

Two other Australian species are used in reforestation. One with red needles (*C. torulosa*) is not proving very satisfactory for this purpose. Another with grayish-green needles (*C. glauca*), much like the long-leaved ironwood, is especially good for binding the soil, as it forms clumps, new plants springing up from the roots.

Chestnut (*Castanea dentata*). Beech family. See page 307.

MULBERRY FAMILY (Moraceae)

Black mulberry, kilika (*Morus nigra* Linnaeus). Figure 16, a. —The black mulberry is long-lived, some trees existing for several centuries. Its home land is temperate, and it can endure some cold. It is an excellent tree for sandy coast ridges. For a long time it has been cultivated in Honolulu. Under best conditions it may reach a height of 60 feet, but ordinarily is low and small, with brown branches, and dark-green, dull, and rather rough leaves. The ordinary silk moth eats the leaves for food; but results are more satisfactory with leaves of the white mulberry. The name "kilika" is the Hawaiian attempt to pronounce "silk." The flowers grow on hairy spikes or catkins, and some develop into fleshy, black fruits, which are good to eat, having a sweet, pleasant taste. In the Old World the tree is cultivated for the fruit alone.—Fernhurst.

From an old legend it seems that once all mulberries were white. Pyramus and Thisbe, the fairest youth and maiden of Babylon, were lovers, whose parents forbade them to see each other. They

planned to meet under a mulberry tree. Thisbe came first and seeing a lioness she fled, leaving her veil behind her. Pyramus, seeing the veil and the lioness, thought Thisbe had been eaten by the lioness, and he stabbed himself. His blood spurted on the white mulberries, and to this day the mulberry has purplish berries.

"Bend the mulberry tree when it is young" and "patience and the mulberry leaf become a silk gown" are Chinese proverbs.

Leaves.—Dark-green, dull, rough above, downy below, broadly ovate, tip pointed, edges toothed, teeth small and close, rather large, not lobed ordinarily; stem short. *Flowers*.—Sexes separate, perianth 4-parted; male: compound in small, hanging, elongate, downy, axillary catkins soon falling, stamens 4; female: compound in small, hanging, downy, short, elliptical, axillary catkins, 2 awl-shaped and downy stigmas. *Fruit*.—Thick, fleshy, blackish, cylindrical, up to 2 inches long, sweet and pleasant tasting. *Home*.—Temperate Asia.

Breadfruit, ulu (*Artocarpus incisa* Linnaeus or *A. communis* Forster). Figure 16, *b*.—From Tahiti early Polynesians brought the first breadfruit trees to Hawaii and planted them, it is said, at Kualoa for a chief of Oahu. The trees are growing throughout tropical Asia and Polynesia, best in hot, moist places, being especially luxuriant in the Marquesas Islands. They are not rare in Hawaii, and examples are scattered here and there around Honolulu.

The breadfruit is one of the most attractive tropical trees. The height ranges from 30 to 60 feet with a maximum diameter of two feet. The foliage is beautiful and luxuriant, consisting of huge, leathery leaves one to three feet long, cut deeply into several blunt lobes. The male and female flowers grow separately on the same tree, the male crowded on a large club-shaped, yellow catkin, the female on a large round receptacle. The fruit develops from the female flowers and is at first green, later brown. It attains a diameter of about six inches, a tough rind covering a mealy pulp. In Hawaii the fruit ripens from June to August, and a small crop is borne in the winter. A Samoan variety also raised in Honolulu has fruit with sweet orange pulp and less deeply lobed leaves; a Tahitian variety has deep-yellow pulp and leaves nearly entire. As no seeds develop, new plants are grown from cuttings and from sprouts rising from the roots.

The tree and its fruit have or had many uses in Polynesia. The wood is light and good for canoes; the smooth, gray bark is fibrous and was one source of tapa; the milky sap was used for filling seams of canoes, as a lime for catching birds, and as a chewing

gum; the fruit is baked or boiled to make edible its sweet, starchy pulp, which is sometimes pounded up like poi. In Samoa the fruit is kept by burying when the crop is great.

In Tahitian myth the breadfruit was the gift of a loving father. Bitter famine came to the land; even fern root was difficult to find. A father said to his wife: "When you wake in the morning go outside. My hands will be leaves. My body will be trunk and branches. The round fruit will be my head; the heart inside will be my tongue. Roast the fruit, soak it, beat off the skin, and eat some, and feed



FIGURE 16.—Mulberry family: *a*, black mulberry (*Morus nigra*), leaves and fruit; *b*, breadfruit (*Artocarpus incisa*), leaves and female flower head, male flower at right; *c*, leaf of peepul tree (*Ficus religiosa*); *d*, creeping fig (*Ficus heterophylla*); *e*, fig (*Ficus carica*), leaves and fruit.

our children and yourself that you may no longer crave food." The wife did not understand the words until the next morning, when she saw a strange tree growing beside her home. Weeping, she gathered the fruit and fed the children and herself. This was the first breadfruit in Tahiti. Hawaii has a similar myth.

Near the lakes of Moanalua Gardens, Honolulu, was a breadfruit tree from which the ghosts of the dead leaped into the underworld. Funeral wreaths were sometimes made of the leaves. Breadfruit trees on a plain on Kauai were said to have been planted by a bow-legged, deep-voiced menehune. There is a legend that Pele, the goddess of volcanoes, was so angry with Kamehameha because his offerings had not been generous enough that she destroyed his grove. Another legend tells of Niheu, a hero, who was much too enterprising and mischievous to please the gods. He especially angered them when he stole a breadfruit that one of them used to roll and thunder across the floor of the underworld. The Hawaiian proverb: "He has become a breadfruit that oozes gum"; refers to a newly rich person.—Fernhurst; 1548 Wilder Avenue; corner Hastings and Anapuni Streets; corner of Bates Street and Nuuanu Avenue.

Leaves.—Alternate, 1-3 feet long, leathery, pubescent, oblong, cut deeply into 3-9 obtuse lobes; leaves of some varieties nearly entire. *Flowers*.—Sexes separate on same tree; male: long, compound flower, club shaped, yellow catkin; female: compound, on large round receptacle, stem large; single flowers small and tubular. *Stamens*.—One. *Pistil*.—Style simple or 2 to 3-fid. *Fruit*.—Green becoming brown, round or oblong, 5-8 inches in diameter, rind tough and covered with a regular pattern showing where separate flowers have ripened to fruit; pulp edible, mealy, sweet; each floral part containing a small nut; seeds lacking. *Home*.—East Indies (Bailey); Malaysia, islands of the Pacific (Kew Index).

Jack fruit, jak fruit, jak wood, jack tree (*Artocarpus integrifolia* Linnaeus).—A strange relative of the breadfruit is the jack fruit, which is rare in Honolulu, a few trees growing by the road behind Punchbowl leading up Tantalus. It reaches a height of about 30 feet and has milky juice. Leaves on older branches are oval or oblong and up to half a foot long, on young shoots very narrow or lobed two or three times. The oblong fruit is a conspicuous feature, for it is not only enormous, weighing from 20 to 100 pounds, but it is borne all along the trunk, on older branches, sometimes underground, and when ripe it has a strong, unpleasant odor. A green rind covered with hexagonal knobs encloses a soft, white pulp,

which is eaten raw or cooked by natives in tropical regions of the East. The pulp is sometimes used as a vegetable in curries, and the large seeds, which when roasted resemble chestnuts, are also used in curries. The tree grows from the seed, and in southern India and Malaysia, its home, it grows in rather moist places to an elevation of 4,000 feet. The wood is excellent for cabinet work and with age changes from yellow to mahogany color. In India a yellow dye is obtained from the heartwood. The tree is also useful for timber reserves.

India rubber tree (*Ficus elastica* Roxburgh).—The full scientific names of 20 or more figs or banyans in and near Honolulu are not known. One of the best-known kinds is the India rubber tree, which is planted in many parts of the world. In cold countries it is used as a pot plant until eight to ten feet high, and its popularity is proved by the fact that in one year in America 80,000 plants were sold. In Honolulu it is medium sized and serves as an ornamental plant. It grows best in damp, tropical forests, where some trees reach a height of 100 feet and have wide-spreading branches and additional roots dropping from the trunk and from large branches. One huge specimen in Assam grew 112 feet high and had 100 aerial roots when 32 years old. Shining, leathery, oblong leaves are enclosed when young in a rosy sheath, which soon falls. Small, greenish-yellow fruits grow in pairs. From its smooth, gray bark comes the commercially important product of the tree, an elastic substance, caoutchouc, which is one-third of the weight of the milky sap. In Assam, trees are first tapped when 25 years old and continue to yield when more than 100 years old. But, it is said, more valuable rubber is obtained from two kinds of South American trees, heveas and castilloas. In Hawaii unsuccessful attempts have been made to raise rubber commercially from a species of hevea and a manihot.—Grounds of Bishop Museum; Washington Place; Queen Emma Museum; Capitol grounds; grounds of University Club.

Leaves.—Smooth, shining, leathery, oblong to elliptical, alternate, abrupt and dull point, 3-12 inches long, veins parallel and at right angles from midrib (50 pairs or so); young leaves enclosed in pink, long-tipped stipule. *Flowers*.—Similar to those of Bengal banyan. *Fruit*.—Oblong, in pairs, sessile, in axils of fallen leaves, greenish-yellow when ripe, 1/2 inch long, at first enclosed in a hooded involucre. *Home*.—Tropical Asia.

Banyan, vada tree (*Ficus benghalensis* Linnaeus). Plates XVII, B; XXII, A.—That large handsome tree, the banyan, is sacred to the Hindus. It is easily recognized by its aerial roots, which grow down from more or less horizontal branches and by their support allow the tree to cover a large area. It gained its name, it is said, from Hindu traders, called Banyans, with whom it was a favorite. Since early times it has been cultivated on islands of the Pacific, in Tahiti, especially, as its bark furnished material for tapa.

Tahitian legend states that it originated in the moon, a large tree there affording shade to many of the moon's inhabitants. One day the goddess Hina climbed this tree to break off a branch for tapa and it fell with such force that it reached Tahiti. There it took root and became the source of all other banyans. Still visible in the moon is the banyan with a branch missing. A New Hebrides legend tells of a banyan root that grew down from heaven, upon which Tagaro climbed up to the sky to recover his lost wife and child. What seems to be one large tree by the Capitol in Honolulu is really two trees, which have gradually grown together by interlacing of branches and sending down of roots. Formerly carriages could drive between the two trunks. Now the protection of its shade is used for autos. The fruit is edible but not popular. The milky juice is employed medicinally in India, where the tree grows from low country to 2,000 feet, especially in dry regions.—Grounds of Capitol; near Bishop Museum; beside the Executive Building; on Cleghorn Drive near Kaiulani Avenue.

Under a beautiful banyan on Cleghorn Drive Stevenson visited with Princess Kaiulani when she was a child, and there he wrote the following lines, when during his second visit to Hawaii the princess was in Europe:

Her islands here in southern sun
Shall mourn their Kaiulani gone,
And I, in her dear banyan shade,
Look vainly for my little maid.

Leaves.—Dark-green, ovate, smooth, or downy beneath, obtuse or obtusely pointed, leathery, shining, evergreen, 4-8 by 2-5 inches, veins prominent, young parts downy; stem 1/2-2 inches long. *Flowers*.—Minute, unisexual, of 3 kinds—male (near mouth of receptacle), female, and imperfect female—crowded on inner walls of a fleshy, paired, stemless receptacle, the mouth closed by overlapping bracts, round, downy, about 3/4 inch in diameter. *Fruit*.—Red figs. *Home*.—India, tropical Africa.

Peepul tree, sacred tree, bo tree (*Ficus religiosa* Linnaeus). Figure 16, c.—In much of India the peepul tree flourishes up to an elevation of 5,000 feet, either wild or cultivated. It is large and long lived and grows 100 feet high. One brought from India in 288 B. C. to Anuradhapura, Ceylon, is the oldest historical tree known and is said to be the parent of all peepul trees in Ceylon. They are found beside every Buddhist temple, being intimately associated with the life of Buddha. Legend states that when Buddha was born a light flashed through the world and in the center of the universe a branch of the peepul tree appeared and grew to be the Sacred Tree. Buddha is said to have sat under this tree for six years in meditation. The heart-shaped leaves still tremble remembering the divine meditations of Buddha. In India there is a saying, "It is better to die a leper than pluck a leaf of a peepul." The peepul is also sacred to Vishnu who, like Buddha, is said to have been born under it. Hindus say that it is the female of the banyan and that it has the power of bestowing fertility upon women.

In Honolulu this tree is rarer than the banyan, growing in parks and in some private grounds. The leaves are different from those of other banyans, being rounded and having long, narrow tips. Their flexible stems cause the leaves to move and rustle in the breeze. The milky juice of the bark, which is present in all kinds of fig trees, is sometimes used for toothache and for strengthening the gums; but no part of the tree has economic value.—Parker Street near Jones Street; opposite upper end of Manoa Park; Moanalua Gardens, 2702 Nuuanu Avenue.

Leaves.—Ovate or rounded with long, narrow tip, alternate; stems 3-4 inches long, flexible. *Flowers*.—As in banyans. *Fruit*.—Dark-purple, paired in leaf axils, 1/2 inch thick, stemless; with broad, leathery bracts. *Home*.—India.

Chinese banyan (*Ficus retusa* Linnaeus). Plate XXII, B.—Another fig or banyan, a large evergreen tree with a few aerial roots, prefers moist regions in its native land, southern Asia, where it is common up to 6,000 feet. The leaves are oval, blunt, and short stemmed. Tiny, yellow or red fruits grow in pairs. Sometimes the fruit does not develop but changes into hairy galls twice the size of normal figs. In Honolulu this is probably the commonest banyan.—Thomas Square.



A



B

PLATE XXII. *A*, BANYAN (*FICUS BENGHALENSIS*), PHOTOGRAPH BY
R. J. BAKER; *B*, CHINESE BANYAN (*FICUS RETUSA*),
ELEPHANT'S EAR AT LEFT.



A



B

PLATE XXIII. *A*, MONKEYPOD (*SAMANEA SAMAN*);
B, KOA (*ACACIA KOA*).

Leaves.—Ovate, alternate, closely placed, obtuse or obtusely pointed, 2-5 inches long, veins 5 or 6 pairs, base narrowed; stem $1/4$ - $1/2$ inch long. *Flowers*.—As in banyan, but male scattered; receptacles of some converted into densely hairy galls twice the size of normal receptacles. *Fruit*.—Stemless, paired, axillary, $1/3$ inch thick, yellow or red. *Home*.—Tropical Asia, Malaysia.

Moreton Bay fig (*Ficus macrophylla* Desfontaines).—In Australia the Moreton Bay fig serves splendidly as a tree for avenues. In Honolulu only a few are located. It thrives in southern and middle California, where, however, it does not seed. The leaves are large, leathery, and green above and below, and before the new ones open they are enclosed in rose-colored sheaths, which soon fall. The roundish fruit, about an inch in diameter, grows in clusters of threes and fours.—Upper part of Nuuanu on site of gardens of old Royal Hawaiian Agricultural Society; Emma Square.

Leaves.—Leathery, alternate, not rusty beneath, 6-10 by 3-4 inches, when young enclosed in rosy stipules 2-4 inches long. *Flower*.—Similar to that of Bengal banyan. *Fruit*.—Nearly round, about 1 inch thick, 3-4 in axils of leaves on short, thick stems. *Home*.—Australia.

Benjamin tree (*Ficus benamina* Linnaeus).—Smaller than the Bengal banyan is the benjamin tree, which is less widely known and is rare in Honolulu. Like some others of the 600 or so species of figs, this fig or banyan may begin life on another tree, on the branches of which fruit is carried by birds. The benjamin tree is one of the most beautiful and graceful of banyans. Its branches are long and drooping and bear leathery leaves, which are oblong and pointed at the tip. Fleshy, yellow fruits develop singly in axils of leaves.—2433 Nuuanu Avenue.

Leaves.—Leathery, light-green, not closely placed, oblong, smooth, pointed at tip; stems rather long. *Flowers*.—Similar to those of Bengal banyan. *Fruit*.—Axillary, solitary, without stems, yellow, fleshy, about $1/2$ inch in diameter. *Home*.—Tropical Asia, Malaysia.

Smyrna fig (*Ficus carica* Linnaeus). Figure 16, *c*.—Caria in Asia Minor or some part of southwestern Asia is supposed to be the home of the fig, a valuable and ancient fruit tree. The fig is popular in mythology. It is said to have been created by Bacchus. The Egyptians believed it was a favorite fruit of the blessed dead. The leaves were supposed to be the first garments of Adam and Eve, and Judas was said to have hanged himself on a fig tree. Mohammed is recorded as saying, "If I were to say any fruit had come down from Paradise, I would say it of the fig."

The tree grows easily in a wide range of temperature, 18° to 120°, and does not ordinarily reach a great height, though it lives long, some large trees still living in California that were brought there more than 200 years ago. The trunk and branches are characteristically gnarled and twisted. The leaves are broad and divided deeply into three to five rounded lobes; they fall in autumn in some climates.

Several varieties are grown in Honolulu, among them the Smyrna fig, which is a superior kind, and the Portuguese raise them with best success. The two principal varieties known are: the purple, the best, which yields two crops a year, and the white and golden, which yields one crop.

The fruit grows without stems singly from new wood at leaf axils, in California on trees two to three years old, and is round to pear shaped. It is eaten raw as a dessert, dried, and preserved, and all the fruit is edible except perhaps the delicate, dull-red, fuzzy skin. This covers a delicious, sweet pulp, white and pink in color, lined within with many small soft seeds—the flowers before the fruit develops, as in the banyan. Warm countries produce largest crops, as Greece about 1,600 pounds an acre. The fruit is pollinated by the fig wasp and also by hand, and if not pollinated, the fruit of some varieties falls. Where grown in large numbers, Smyrna figs are pollinated thus: a winged female wasp (the male is wingless) carrying pollen from wild figs cuts through scales at the end of a half-grown Smyrna fig and gains entrance to the flower and seed space. She dies there and is absorbed by the vegetable cells after the flowers are pollinated.—Corner of Poki Street and Wilder Avenue.

Leaves.—Broadly oblong, deeply divided into 3-5 rounded lobes, alternate. *Flowers*.—Similar to those of banyan. *Fruit*.—Round to pear shaped, solitary, some 3 inches long, on new wood at leaf axils; delicate, dull-red, fuzzy skin covering soft, white and pink, sweet-tasting pulp, lined within with many small soft seeds, which form a wall around the empty central space. *Home*.—Caria, Asia Minor (Bailey); Europe, Orient, north and south Africa (Kew Index).

Creeping fig (*Ficus heterophylla* Linnaeus). Figure 16, *d*.—The creeping fig is a vigorous vine, which is well suited to stone walls, on which it clings closely. If not pruned, the branches stretch out and change the vine to a shrub. Stems and leaves are downy, the leaves being small except on fruit-bearing branches. They are

oval, blunt, and unequally divided at the base. The figs are pear shaped and dry.—Pauahi Hall, Punahou Campus; 2447 Parker Street.

Leaves.—Entire, some wavy, alternate, ovate, obtuse, unequally indented at base, more or less 2-ranked, veins prominent below, largest on fruit-bearing branches; stems short. *Flowers*.—As in the Smyrna fig. *Fruit*.—Fig, dry, pear shaped. *Home*.—Japan, China, Australia (Bailey); India (Kew Index).

There are many legends and myths regarding banyans; but it is not always possible to tell to which banyan a legend refers. It is said that a saint of India once asked God to show him his delusive power. A flood was sent, and the banyan alone floated on the water. On the branches sat a little child, who saved the terrified saint. A Fijian myth connects the banyan with a flood sent by the angry serpent god, while in Rarotongan myth the banyan helped hold heaven in place. In Polynesian legend Maui is credited with hiding fire in the banyan.



FIGURE 17.—Nettle family: *mamake* (*Pipturus albidus*), leaves and fruit.

NETTLE FAMILY
(Urticaceae)

Mamake, mulberry (*Pipturus albidus* Gray). Figure 17.—On the outskirts of forests and in clearings in Hawaii, mostly between 1,500 and 4,000 feet, *mamake* trees are growing. On Oahu they grow 15 or more feet high and can be distinguished by their foliage, though it varies considerably. The leaves are broadly oval in shape and light colored and are woolly beneath. They have three prominent veins, which are red in some plants. The tiny, curious flowers grow in small heads, some developing into stemless, white berries, which are edible but tasteless and rather dry. The smooth, light-

brown bark, which is matted with gray, woolly hairs on the young branches has a fibrous inner layer, formerly one of the two principal sources of Hawaiian tapa, *wauke*, which is now quite rare, being the other. From *mamake* coarse, heavy tapa was made.—Along upper Tantalus road; road near the Pali in Nuuanu Valley.

Leaves.—Alternate, ovate, 3-4 by 1-4 inches, acute, edges scalloped or with small, sharp teeth, papery to leathery, with a few bristles or smooth above, white to gray or light-green to brown, with matted woolly hairs beneath on spaces between the darker veins; 3 prominent veins, pale-green or red; stems $1/2$ -1 $1/2$ inches long. *Flowers*.—About $1/4$ inch in diameter, sessile, in axillary clusters, nearly clasping the stem, white, woolly or bristly; male and female flowers borne on separate plants or female on upper part of a branch, male on lower part, in some cases both sexes in one head; male: reddish, 4-lobed to the middle or less, stamens 4, hairy rudiment of a pistil; female: on a thick receptacle, becoming fleshy, perianth 2-4 toothed, white, stigma slender and downy on 1 side and commonly hooked. *Fruit*.—Like a mulberry, edible, white, sections fleshy; a tiny nut-like seed closely covered by the fleshy perianth. *Home*.—Hawaii.

BOTTLE-BRUSH FAMILY

(Proteaceae)

Silk oak, silver oak, he oak (*Grevillea robusta* A. Cunningham). Figure 18, *b*.—Avenues shaded with rows of sturdy silk oaks are particularly attractive in Honolulu in May, June, and the first part of July, when the branches are laden with rich-orange, fringed blossoms. Some flowers can be seen from April into fall. After the seeds escape, ornamental clusters of black seed cases remain and stay throughout the year, each case with its long filamentous tip suggesting an elf's cap. The robustness of the tree is acknowledged in its scientific name, a character that might also explain its popular name of silk oak, as it is not an oak. In reality the popular name was taken from the silky and oaklike grain of the wood, which is used in Australia by cabinet makers. The wood is not durable where in contact with the soil. It is so pliable that the tree makes a good windbreak. It has other valuable qualities; for it grows quickly, resists drought, affords shade, and thrives at many different elevations—between sea level and 4,000 feet. As the seeds are winged and exceptionally light, they are carried for miles by the wind. They germinate in bare, rocky soil, and so the tree is found self-sown here and there in native forests. The tree may grow 100 feet high or more. It is evergreen, the fernlike leaves becoming rusty in Febru-

ary and gradually being replaced by fresh, yellow-green ones. The gray, shallowly furrowed bark exudes a yellow gum.—Oahu Avenue between Kaala Avenue and Armstrong Street; Keeaumoku Street in front of Experiment Station of Hawaiian Sugar Planters' Association.

Leaves.—Dull-green, pinnate, fernlike, alternate, of many forms, up to 8 inches long, silky on the under side. *Flowers*.—In unilateral spikelike racemes, 3-4 inches long, on pedicels $\frac{1}{2}$ inch long, 1 or several racemes to-



FIGURE 18.—Bottle-brush family: *a*, macadamia (*Macadamia ternifolia*), leaves and nuts; *b*, silk oak (*Grevillea robusta*), leaf, flowering stem, seed cases, seeds.

gether on short, leafless branches of old wood; flowers small, orange. *Calyx*.—Narrow, orange tube, bearing honey, 4-parted. *Corolla*.—Lacking. *Stamens*.—Borne on 4 lobes, anthers sessile. *Pistil*.—Style 1, long, protruding when released from stamen-bearing lobes. *Fruit*.—Leathery follicle opening by 2 valves and enclosing 2 light seeds membranously winged all around, which are abundant but seldom found. *Home*.—Queensland.

Macadamia nut, Australia nut (*Macadamia ternifolia* F. von Mueller). Figure 18, *a*.—In subtropical eastern Australia the macadamia nut tree is at home, and it grows farther south in valleys. Its growth seems fairly rapid, and some trees bear fruit when seven years old. In southern California it is cultivated successfully, and in Hawaii the first trees introduced about 1890 grew and bore so well that an orchard of approximately 2,000 trees has recently been planted on Round Top, and another 6,000 in Kona, which already promise success to their owners.

Heavy, shining, dark-green foliage, added to a regular shape, make a handsome tree of this medium to large-sized relative of the silk oak. Small, white, tasseled flowers grow on long spikes, and the oblong leaves are edged with fine teeth. But the most interesting part of the tree is its crop of nuts, which ripens in the fall. When cracked, the smooth, extremely hard shell is found to contain a white kernel of delicious flavor, resembling hazelnuts and almonds in flavor and consistency. The kernels are good raw or roasted and contain about 66 per cent fat.—Round Top; 56 Wyllie Street; park at corner of King and Keeaumoku streets.

Leaves.—Dark-green, shiny, up to a foot long, smooth, oblong, edged with fine teeth, 3-4 together. *Flowers*.—On a long spike, small, white tasseled, pedicelled in pairs, perianth not recurved; stamens 4, affixed a little below the blades; disk ringed, 4-parted. *Fruit*.—Nut with thick, smooth, brown, hard shell; 1 inch thick or more, containing solid, white, oily kernel resembling almonds; covering of shell is leathery, 2-valved. *Home*.—Australia.

BIRTHWORT FAMILY

(Aristolochiaceae)

Aristolochia (*Aristolochia*, several species).—In countries with warm and temperate climates many kinds of aristolochias may be found, plants noted for their strange-looking flowers. Most are woody vines, in cool countries cultivated only in greenhouses, in the Tropics outdoors, where if climbing on trellises they furnish shade and screen as well as decoration. The flowers of some kinds are very large and bad smelling, of others smaller and odorless, and all have bent tubes of more or less peculiar shapes, which have won

such popular names as pelican or goose flower, Dutchman's pipe, fly-catcher. The colors are strange, too, the commonest being purple, yellow, green, brown, and white, ordinarily arranged in veined or spotted patterns. Leaves vary from long and narrow to heart shaped. The fruit is divided into six valves, which open outwards at the top, in one kind, at least, hanging by radiating threads that are attached to the stem above. One of the few kinds found in gardens in Honolulu develops quickly from seeds, flowering the first year. Except as oddities aristolochias are little valued; though in tropical America they are believed to have the power to cure snake bite and are employed for this purpose.—In a few gardens.

Leaves.—Alternate, lanceolate to heart shaped, some evergreen, some not affected by insects or disease. *Flowers*.—Axillary, some large and bad smelling, others smaller and odorless, colors given above. *Calyx*.—Corolla-like, tubular, variously bent, commonly tumid above ovary, irregular, lip with recurved margins and with long hairs within. *Corolla*.—None. *Stamens*.—Ordinarily 6, short and adnate in circle to style, filaments none. *Pistil*.—Ovary inferior, long, 6-celled, with numerous ovules; style short, 6-lobed. *Fruit*.—Capsule, opening into 6 valves, which may be attached by threads to a short stem; seeds numerous, triangular, fast growing. *Home*.—Warm and temperate climates throughout the world.

BUCKWHEAT FAMILY

(Polygonaceae)

Mexican creeper, mountain rose, Confederate vine, chain of love (*Antigonon leptopus* Hooker and Arnott). Figure 19, *a*.—The Mexican creeper is a sun-loving vine with slender, smooth stems and tuberous roots. It has been picturesquely called "hearts-on-a-string." Much of the year it brightens many parts of Honolulu with its masses of beautiful rose-pink flowers (rarely white), wherever it climbs on banks or walls or larger plants. The seed cases, small, angled, and brownish, are also attractive but not conspicuous among the wavy-edged, heart-shaped leaves. Usually producing small tubers, now and then the roots produce large ones weighing as much as 15 pounds. These are edible, have a nutlike flavor, and in Mexico are used for food.—Lanihuli Drive, along north bank near Manoa Road; 2355 Oahu Avenue; Country Club; Makiki Valley, nursery of Board of Agriculture and Forestry.

Leaves.—Heart-shaped, pointed, or spear-shaped, 3-5 inches long, alternate, veins in a network. *Flowers*.—Rose-pink, rarely white, 6-15 in a raceme ending in branching tendrils, stem bending at joints in zigzag form. *Calyx*.—Sepals 5, colored and petal-like, the 2 interior ones narrower. *Corolla*.—

Lacking. *Stamens*.—Eight. *Pistil*.—Styles 3. *Fruit*.—Persistent calyx surrounding 3-angled achene, brown. *Home*.—Mexico.

Muehlenbeckia (*Muehlenbeckia platyclados* Meissner).—A muehlenbeckia from the Pacific, cultivated for its odd flat stems and showy fruit, is rare in Honolulu. It is a shrub or vine with green ribbon-shaped branches, functioning as leaves. For though leaves appear they fall soon after developing. From the small, white blossoms develop showy, bright-red or purple fruits.—1714 Beckley Street.

Leaves.—Oblong-lanceolate or spear-shaped, thin, alternate, falling soon after developing. *Flowers*.—White, small, in few-flowered clusters, axillary, sexes separate. *Calyx*.—With 5 nearly equal lobes. *Corolla*.—Lacking. *Stamens*.—Eight. *Pistil*.—Styles 3. *Fruit*.—Achenes 3-angled, in fleshy perianth, which when ripe is bright-red or purple. *Home*.—Solomon Islands.

Sea grape, shore grape, pigeonwood, horsewood, hopwood [*Coccoloba uvifera* (Linnaeus) Jacquin]. Figure 19, *b*.—In thickets along sandy shores in warm parts of America the sea grape is in its native element, even thriving in barren beach sand. In Honolulu it is not very common. It becomes a tree 20 to 45 feet high, the largest having a diameter of 3 feet. The branches, which grow in zigzags, form a dense canopy. The bark is thin, smooth, and brown, and is said to have medicinal properties, curing fever. While the tree itself is highly ornamental, beautiful broad, round leaves



FIGURE 19.—Buckwheat family: *a*, Mexican creeper (*Antigonon leptopus*), leaves, flowers, buds, fruit; *b*, sea grape (*Coccoloba uvifera*), leaves and fruit.

with red veins add to its attractiveness. In Mexico the early Christians are said to have found the leaves useful, employing them as a substitute for writing paper. When the leaves are fresh a sharp point makes white scratches on the glossy surface, and in this way the Spaniards wrote messages, which they sent Indians to deliver.

The flowers of the sea grape grow in erect clusters. From the edible astringent berries, which hang in clusters, an alcoholic drink is prepared in the West Indies. The roots are also astringent and are used to cure dysentery. The wood is hard, polishes well, and is valued especially in Jamaica for cabinet work; it also supplies fuel. When boiled it becomes reddish and yields a red dye. The tree grows from cuttings or seeds.—Grounds of University of Hawaii and of Royal Hawaiian hotel.

Leaves.—Round or broadly heart-shaped, wavy margined, glossy, leathery, minutely downy beneath; midrib large and red at base, some veins red; stems short, stipulate. *Flowers*.—Racemes 6 inches long, erect, perianth tube accrescent and enclosing the fruit, in spicate bundles within small bracts. *Calyx*.—Sepals 5, white, fragrant, 1 1/2 inches across. *Corolla*.—None. *Stamens*.—Eight. *Pistil*.—Styles 3. *Fruit*.—Berries, 9 or more hanging in dense heavy raceme, pear shaped, red-purple with green dots, sweetish acid; nut large, round, with short sharp point on top and vertical wrinkles. *Home*.—American Tropics.

AMARANTH FAMILY

(Amarantaceae)

Spiny amaranth, soldier weed (*Amarantus spinosus* Linnaeus). Figure 20, *a*.—A coarse weed common on waste land and by roads in Honolulu and other parts of Hawaii is the spiny amaranth. It grows one to four feet high and has stout, smooth, shining, cylindrical stems, which are much branched. The oval or narrow leaves bear a spine at the tip and two spines at the base, all of which makes the plant an object to be avoided by man and beast, though in Ceylon when cooked the tender leaves and stems furnish a food used by poor natives. It is never cultivated. The seeds are small, are produced abundantly, and in two months can develop into plants bearing seeds. This amaranth has long vitality; but as it is propagated by seed only, it is not so difficult to control as are some other plant pests.—On roadsides.

Leaves.—Ovate-lanceolate, tapering to base, obtuse, spiny-tipped, undulate, 1-3 inches long, smooth above, slightly scurvy beneath, alternate, lateral veins numerous and prominent beneath; stem 1/2-2 inches long, at base a pair of

sharp spines about $1/3$ inch long. *Flowers*.—Small, numerous, in axillary and terminal interrupted spikes, pale-green, upper mostly male; male fewer than female; bracts linear, tipped with bristles; perianth leaves (sepals) 5, longer than bracts, ovate, bristle pointed, in disorder as are other floral parts. *Stamens*.—Spreading, 5. *Pistil*.—Styles 2, long, hairy, spreading. *Fruit*.—Seed small, lens shaped, slightly compressed, dark-brown, polished. *Homz*.—Tropical regions.

Joy weed, alternanthera (*Alternanthera versicolor* Regel). Figure 20, c.—Bordering paths and flower beds is commonly seen forming efficient little barriers the small plant, alternanthera. It adapts itself readily to man's wishes, for it can be trained to fill in areas as he desires. Its ornamental variegated leaves, which are different shades of red with patches of green, are its most striking feature. The small light-colored flowers are inconspicuous.—Y. W. C. A. Beach Club house, lining part of walk; foot of Bishop Street, forming letters on lawn by power house of Hawaiian Electric Company; forming letters on lawn of Tripler General Hospital, Fort Shafter.

Leaves.—Variegated, some being different shades of red with patches of green between the veins, some bronze or greenish-yellow, round-spatulate, narrowed into a short stem, entire, opposite. *Flowers*.—In single or paired dense axillary heads, without stems, small, whitish, with two bractlets. *Stamens*.—Five functioning, five not. *Home*.—Brazil.

BATIS FAMILY

(Batidaceae)

Akulikuli (*Batis maritima* Linnaeus).—In 1859 Dr. Hillebrand, the botanist, first noticed the *akulikuli* in Hawaii, in salt marshes near Honolulu. Since then it has spread to many low places near the shore, growing in extensive, dense, bright-green patches, and at one time covered so much of Sand Island that it was called "Akulikuli Island." It is a low, smooth, woody-stemmed shrub two to three feet long, the young branches of which are erect. It has fleshy, paired, almost cylindrical leaves about an inch long. When broken open these are found to contain much salty-tasting juice, which has won for the plant the local name of "pickle weed." In the neighborhood of patches of *akulikuli* is a strong odor also resembling that of pickles. A shrubby daisy, the *pluchea*, grows along the edges of some of these patches. This *akulikuli* is sometimes confused with a native one (*Lycium sandwicense*).—Near canal at Waikiki; in marsh near Ala Moana; near Koko Head.

Leaves.—Fleshy, oblong-linear, about 1 inch long, flattened above, convex beneath, opposite. *Flowers*.—Catkins oblong-cylindrical, axillary and terminal, much shorter than the leaves, the 2 sexes on separate plants; male flower with 4 stamens alternating with 4 thin scales enclosed in thin bifid involucre and attached to base of a round bract; female catkins shorter than male, quadrangular, 12 pistils in 4 rows, flower half set in fleshy axis and having one bract, pistil with 4-celled ovary, 1 ovule in each cell, stigma 2-lobed. *Fruit*.—Nearly 1 inch long, some 2-horned at top, fleshy. *Home*.—Jamaica.

FOUR-O'CLOCK FAMILY

(Nyctaginaceae)

Four-o'clock, marvel of Peru (*Mirabilis jalapa* Linnaeus). Figure 20, *b*.—Self-sown by roads in some parts of Honolulu, four-o'clocks are growing as garden escapes, their funnel-shaped, dainty, red, white, yellow, or striped flowers perfuming the air while gladdening the eye. Except in cloudy weather they are open only from late afternoon till the following morning. The plant is also a garden favorite, making good low hedges and growing new every year from seed to a height of a foot or two. Four-o'clocks are probably not so harmless as they look, for it is said that their seeds are poisonous and also the tuberous roots, which at one time were mistaken as a source of the medicine jalap. The flower has always been popular with Hawaiians for leis for late afternoon and evening wear.—Wild on Oahu Avenue near junction with Manoa Road.

Leaves.—Ovate-lanceolate or somewhat heart shaped, opposite, sharp pointed, in some plants variegated, 2-4 inches long; stems 1/2-1 inch. *Flowers*.—Red, white, yellow, or striped, on short stems, solitary in axils and crowded near apex. *Calyx*.—Colored, 5-cleft, about 1 inch long, funnel shaped, exceeding the 5-cleft involucre. *Corolla*.—Lacking. *Stamens*.—Joined at base about as long as the tube, 5. *Pistil*.—Exserted a little, stigma round. *Fruit*.—Conspicuous black seeds in the persistent involucre. *Home*.—Mexico.

Bougainvillea (*Bougainvillea spectabilis* Willdenow). Figure 20, *d*.—The kind of bougainvillea most commonly cultivated in Hawaii is taller and straighter than the smooth one with rose-red flowers (*B. glabra*). It has purplish-red flowering parts and quite thorny stems. In some places it grows without support, in a large shrubby mass with spreading and drooping branches, and it may be trained to tree-like form. The leaves are not only hairy but thicker and larger than those of the rose-red kind. They blossom at about the same time. One of the oldest bougainvilleas bearing purplish-red flowers in Honolulu was planted about 1875 and is growing on

the corner of King and Alapai streets at Fernhurst; another is climbing on St. Clement's Church. This kind comes from Brazil.



FIGURE 20.—Amaranth family: *a*, spiny amaranth (*Amarantus spinosus*), leaves and flowering spikes; *c*, joy weed (*Alternanthera versicolor*), leaves and flowers. Four-o'clock family: *b*, four-o'clock (*Mirabilis jalapa*), leaves, flower, seeds; *d*, bougainvillea (*Bougainvillea spectabilis*), leaves and bracts with flowers.

A color variety with brick-red bracts is growing on the Punahou grounds near the entrance on Alexander Street and also across the street from there. Another color variety that may possibly be classified here has lavender flowers, only one vine of which, apparently, is growing in Honolulu, corner of Keeaumoku and Dominis streets. Some years it begins to flower the middle of March.

Bougainvillea (*Bougainvillea spectabilis* Willdenow var. *parviflora* Von Martius).—The so-called everblooming bougainvillea

overhangs the stonewall lining Nuuanu Stream between Beretania and King streets. Its flowering parts are a dazzling purple-red with more conspicuous tubular flowers than the ordinary kind, which otherwise it closely resembles. Flowers are borne much of the year, especially in winter.

Bougainvillea (*Bougainvillea glabra* Choisy).—The very decorative sun-loving bougainvillea vines from South America cover tree trunks and low buildings and pergolas with their strong, rapidly climbing stems in many parts of town, one popular kind with showy rose-red flowering parts. Its smooth or slightly thorny branches are clothed with dark-green, broadly oval, pointed leaves. The flowers grow in large massed clusters, individuals consisting of three gaudy rose-red bracts, which hold in the cup they form three small, yellow, tubular flowers. The vines are brightest, perhaps, in January and February and in May and June.—Keeaumoku Street, between Heulu and Dominis streets; Kamanele Park.

Leaves.—Broadly oval, pointed, dark-green, glossy, smooth, alternate. *Flowers*.—Three rose-red bracts, which are heart shaped or pointed ovate and distinctly veined, surrounding 3 flowers or each subtending a flower; flowers small, inconspicuous, long tubular, margin 5-6 lobed. *Stamens*.—Seven to eight. *Fruit*.—Not known in Honolulu. *Home*.—Brazil.



FIGURE 21.—Purslane family: pigweed (*Portulaca oleracea*), leaves and empty seed cases.

PURSLANE FAMILY

(Portulacaceae)

Pigweed, purslane, pusley, wild portulaca, duckweed, ihi, aku (*Portulaca oleracea* Linnaeus). Figure 21.—Pigweed is abun-

dant in many warm countries. On lawns and in gardens it can be seen in Honolulu as a smooth fleshy plant bearing small, flat, reddish or dull-green leaves and lying close to the ground. Many branches spread irregularly from a long main root. Pigweed has some value, for in many countries it is cooked and eaten, especially a French upright form, which is quite tender; livestock eat it readily.—On lawns.

Leaves.—Obovate or spatulate, obtuse, thick, dull-green or reddish, flat, alternate or in clusters at ends of branches. *Flowers*.—Small, yellow, sessile, above the last leaves or bracts, open only for a few hours in the morning, blossom all the year. *Calyx*.—Two-cleft, limb deciduous, tube cohering with ovary, sepals keeled. *Corolla*.—Petals 5, very fugacious, scarcely exceeding calyx, thin, yellow. *Stamens*.—Inserted on calyx, 7-12, sensitive to touch. *Pistil*.—Style 5-cleft, short. *Fruit*.—Capsule, urn shaped, one-celled, opening transversely, upper half falling off, enclosed in sepals; seeds numerous, minutely granulose, dark-brown, scattered widely by wind. *Home*.—Southwestern United States (Bailey); warm regions (Kew Index).

WATER-LILY FAMILY

(Nymphaeaceae)

Egyptian lotus, Indian lotus, Pythagorean bean, sacred bean, nelumbo (*Nelumbium speciosum* Willdenow). Figure 22.—The lotus is a vigorous plant growing in ponds and slow streams, on the surface of which its large, rounded, long-stemmed leaves lie, or else they rise a foot or two above it. Higher than the leaves rise the white or rose-colored, fragrant flowers, resembling those of the water lily in many ways. On windward Oahu a few swampy places can be seen covered with lotus plants, which crowd out most other aquatic kinds. They will not survive in countries subject to frost. Strong, large, underground roots, which creep in mud at the bottom of ponds where the plants live, bear tubers. These are edible and starchy like sweet potato and in markets in Japan and Hawaii are sold as a vegetable. Stems are used as a cure for fever and dysentery in Ceylon. The fruit is peculiar, being an oval, flat-topped receptacle dotted with holes, each containing a one-seeded case. The seeds do not lose their vitality for several years; they are pleasant tasting and are used as food somewhat in Ceylon. It is said that the ancient Egyptians planted the seeds by placing them in balls of muddy clay and chaff and sinking them in water. It is not cer-

tain, however, that this is the same lotus held sacred by the ancient Egyptians, as it no longer grows in Egypt, and at least one authority thinks a pond lily was the Egyptian lotus.



FIGURE 22.—Water-lily family: Egyptian lotus (*Nelumbium speciosum*).

The lotus is associated with Buddhism. It is the emblem of Buddhism, and Buddha and Buddhist saints are pictured as seated on the lotus flower. The wheel-like form of the blossom is symbolic of perpetual cycles of existence. Poets of India say the lotus was dyed by the blood of Siva, who was wounded by the arrow of Kama, the Cupid of India. An early Sanskrit play contains the lines, "My beloved, thy eyes are two lotus buds, thy hand the full-blown flower, thy arms its graceful roots." This plant is not related to the lotus tree, the plumlike fruits of which were said to have been eaten by a group of people in northern Africa called "lotus eaters," who were supposed to have become carefree as a result. The lotus is one of the few plants cultivated since ancient times for its flowers. A distinct species with yellow flowers is a native of North America.—Outskirts of city, as swamps at Kaneohe Bay.

Leaves.—Round or nearly so, entire, 1 foot or more in diameter, peltate, powdery-white, smooth, radiately veined, flat or concave, floating or standing above the water; stems long, rough with distant prickles. *Flowers*.—White or rose-colored, showy, fragrant, overtopping leaves, 4-10 inches in diameter; peduncles rough, equaling or exceeding leaves (2-3 feet above water), rising at nodes of stem and sheathed at base. *Calyx*.—Sepals 4 or 5, small, falling early. *Corolla*.—Petals 15 or more, erect or spreading, 3-5 inches long, oval, obtuse, veined, concave, soon falling. *Stamens*.—Many, on broad short filaments with appendage beyond anther. *Pistil*.—Style short, stigma capitate.

Fruit.—Receptacle oval, smooth, perforated on its flat top, 2-4 inches wide, spongy, containing many distinct carpels 1/2 inch long and 1-seeded; carpels not distinct in *Nymphaea*. *Home*.—Northern Africa, tropical Asia (Kew Index).

Water lily, pond lily (*Nymphaea*, several species). Plate XII, B. —Perhaps the most beautiful flowers borne by an aquatic plant are pond lilies. They are also showy and in pools in Honolulu are commonly red or blue, cup shaped, several inches in diameter, and composed of many overlapping petals. They float on top of the water, each flower lasting one to seven days, opening later and closing earlier on the first than on the following days. When its blossoming time is ended, the flower stem coils, and the flower descends into the water, where the seed ripens and where six to ten weeks later the ripened pod bursts. Then the seeds rise to the surface, float about for awhile, and finally sink. In a well-developed plant the rootstocks or tubers root in mud over which the water may be three inches to six feet deep. The tubers as well as the seeds of several kinds of pond lilies are eaten in some countries for the large amount of starch they contain, and one kind is said to have medicinal properties. The rounded, leathery leaves are attached by long stems to the tubers and either float on the surface of the water or, if crowded, rise a few inches above it. They contain tannin. As the different kinds of pond lilies cross readily, many hybrids are formed.—Pools at Punahou and Kapiolani Park; grounds of Central Union Church.

The Greeks dedicated this water plant to the nymphs; hence the scientific name *Nymphaea*. The Chippewa Indians have a myth of a star that longed to be loved by earth children and so allowed her beauty to dissolve in the lake and became a water lily. An old German legend tells of a beautiful maiden who was so charmed at the beauty of a prince that she forgot a cruel old woman's admonition that if she spoke to a man the golden thread she was weaving would lose its brightness. When the old woman saw the tarnished thread she turned the maiden into a water lily, which was finally rescued by the prince, and changed into a princess ten times more beautiful than before.

Leaves.—Round or ovate, entire or dentate, some wavy, several inches in diameter, leathery, floating or rising above surface of water; stems long, provided with long air canals. *Flowers*.—Showy, white, yellow, blue, red, in all shades; 1-14 inches across. *Calyx*.—Sepals 4. *Corolla*.—Petals and carpels

many; stem long. *Stamens*.—Many. *Pistil*.—With broad, cup-shaped depression in center of flower, surrounded by a ring of fleshy processes, the carpellary styles, having a knob at the center. *Fruit*.—A pod that bursts under water and scatters seeds that float to surface on a buoyant aril. *Home*.—Different kinds from Europe, Asia, America.

CUSTARD-APPLE FAMILY

(Anonaceae)

Ylang-ylang [*Canangium odoratum* (Lamarck) Baillon].—The ylang-ylang (or ilang-ilang), noted for its heavy-scented flowers, grows here and there on lawns and in parks in Honolulu. It is a medium-sized tree, and its drooping branches are clothed with long, pointed leaves. The flowers, also drooping, are of peculiar color, being green at first and turning yellow. In the Philippines the oil for perfume expressed from them forms an important export. In Hawaii and islands of the south Pacific they are used for leis, and a not uncommon sight in Honolulu is a greenish-golden lei of ylang-ylang flowers wound around the crown of a hat. The fruit, greenish, fleshy, oblong, forms on flower stalks that lengthen as the fruit develops. Samoans make canoes of the wood, and Malaysians hollow out the trunks for drums.—In a few gardens and parks.

Leaves.—Oblong, tips pointed, 5-8 inches long. *Flowers*.—Greenish becoming yellow, hanging, heavy perfumed. *Corolla*.—Lanceolate petals, 1 1/2 by 1/3 inches. *Fruit*.—Fleshy, oblong, green or olive-green, nearly an inch long, on stalks that elongate. *Home*.—Burma, Java, Tenasserim, Philippines.

Ylang-ylang [*Artabotrys uncinatus* (Linnaeus) Merrill]. Figure 23, *b*.—Another ylang-ylang, a climbing woody shrub with smooth stems, has greenish flowers with an odor much like the flowers of the canarium. The blossoms are so very fragrant that in India, where they are abundant, perfume is made from them. As the flower stems are hooked they offer an efficient means for aiding the young branches to climb, as several plants do on arbors and trees in Honolulu. The thick, pointed, oblong or narrow leaves serve in India as a medicine. This shrub is cultivated in many warm countries, somewhat in southern Florida and southern California.—In a few gardens.

Leaves.—Shining, oblong or lanceolate, pointed, thick, dark-green, evergreen. *Flowers*.—Greenish, very fragrant, solitary or in pairs; borne on flat, hooked, woody branches or peduncles. *Calyx*.—Sepals 3. *Corolla*.—Petals 6, in 2 rows, nearly equal, bases concave, coherent at base. *Fruit*.—About 2 inches long, obovoid, yellow, ripe carpels fleshy, 2-seeded. *Home*.—India.

Soursop (*Anona muricata* Linnaeus). Figure 23, *a*.—The name "soursop" is most appropriate for a rather uncommon tree in Honolulu. For the large, irregularly heart-shaped, softly spiny fruit has an edible pulp like white cotton saturated with a sour-tasting juice. This is popular refreshment in parts, at least, of tropical America, its home, where it is used by people and by stock. The flowers, ordinarily appearing singly, have a peculiar odor and are greenish-yellow. The leaves, smooth and shiny-green on top, for a time have underneath a reddish down, which eventually disappears. They have an unpleasant odor. The tree is shrubby, evergreen, small (12 to 20 feet high), and it grows rapidly.—In some gardens.



FIGURE 23.—Custard-apple family: *a*, soursop (*Anona muricata*), leaves and fruit; *b*, ylang-ylang (*Artabotrys uncinatus*), leaves and flower.

Leaves.—Smooth, elliptical or oval or obovate, pointed, shiny on top and rusty beneath but becoming smooth, ill-scented. *Flowers*.—Greenish-yellow, most solitary, odor peculiar. *Corolla*.—Six petals: 3 outer 1-2 inches long, scarcely exceeding the inner ones, yellow or green; 3 inner ones yellow or red. *Pistils*.—Many. *Fruit*.—Irregular heart-shaped, 6-8 inches long, 1-6+ pounds; dark-green, shiny, ill-smelling skin bristling with many soft spines; pulp soft, white, cottony, saturated with a sour-tasting juice, with a black seed about an inch long in each section. *Home*.—Tropical America.

Uncommon in Hawaii are three kinds of *Anona*, small trees between 10 and 25 feet high, which bear delicious fruit. The cherimoya (*Anona cherimolia*), from South America, has broadly oval or oblong, dark-green leaves that are velvety beneath, and heart-shaped fruit covered with small knobs; the seeds are used as an

insecticide, medicinally as an emetic. The custard apple or bullock's heart (*A. reticulata*), from the West Indies, has long, narrow, brittle, light-green leaves and heart-shaped fruit that is smooth except for small depressions; leaves and branches are used for tanning. The sugar apple or sweetsop (*A. squamosa*), from the West Indies, has narrow leaves shorter than those of the custard apple and oval fruit that is covered with many large, prominent knobs; both leaves and fruit have insecticide properties; in the Philippines the plant is supposed to be very efficacious against witchcraft.

LAUREL FAMILY

(Lauraceae)

Camphor tree (*Cinnamomum camphora* T. Nees and Ebermaier).

—One of the most beautiful and rarest trees in Honolulu, an ever-green kind brought here many years ago, is the camphor tree. It is quite large and reaches a height of 40 feet. Though of Oriental origin, coming from China and Japan, it grows well in most warm countries. In Honolulu one is growing at the corner of Nuuanu Avenue and School Street, a few at the corner of Judd and Liliha streets. Smooth, shining, thick leaves, oval or elliptical in shape, grow alternately on the branches and when crushed have the odor of camphor, as do all other parts of the tree, which is therefore insect proof. Linen stored in boxes of camphor wood keeps well. By distilling or boiling the chopped wood and root an aromatic, white, volatile gum is yielded that is used medicinally. Small, yellow, six-parted flowers grow in clusters from the base of the leaves and enlarge and surround the oval fruit as it develops.

Cinnamon tree (*Cinnamomum zeylanicum* Nees).—The spice tree, cinnamon, noted for its commercial products of oil and sticks yielded by the inner bark, is found in few gardens in Honolulu. Its home is the East Indies and Malaysia. In many ways it resembles the camphor tree. It is of medium height, is smooth, except for a silky covering on the buds, and has thick, reddish bark and purple fruit less than half an inch long.

Alligator pear, avocado pear (*Persea americana* Miller). Figure 24.—In forests near the coast of tropical America the alligator pear originally made its home. But owing to the popularity of its

rich fruit, it has been carried to many other warm countries. In Hawaii it is common on lawns and in gardens, and it is said that the first trees were planted by Don Marin in Pauoa Valley.

Many varieties are grown here; and Kona, Hawaii, to elevations of 1,600 feet, seems to be an especially satisfactory location. It is a medium-sized tree, is always green, and grows fast in good but not dry soil. As the wood is brittle, wind is a disadvantage. It begins to bear when from four to eight years old, continuing for about 25 years. A good tree bears about 500 fruits a year, some 1,200. In Honolulu, the main part of the crop is during June, July, and August. Most trees are grown from seeds. Formerly in Peru the Indians had a five-day festival in December, which they believed made the alligator pear ripen.



FIGURE 24.—Laurel family: avocado pear (*Persa americana*), leaves and fruit.

In the spring, every year or alternate years, long, dense, and downy clusters of tiny greenish-yellow flowers are conspicuous. The fruit varies in size and flavor, and is round or oblong or pear shaped. A green or purplish, smooth, leathery skin covers a nut-flavored green and yellow, slightly fibrous pulp of the consistency

of butter, which contains 4 to 29 per cent of a greenish oil that is sometimes extracted and used for lighting and soap making. From the pulp delicious salads can be prepared. The large rounded seed within yields a stain with which linen can be indelibly marked; if ground up and mixed with cheese or meal it is used to poison rats.

—Corner Poki Street and Wilder Avenue.

Leaves.—Oblong or elliptical or ovate, 4-16 by 2-10 inches, pointed or obtuse, very downy when young. *Flowers*.—Greenish-yellow, in dense clusters, downy, each about 1/4 inch long. *Calyx*.—Deeply 6-parted. *Corolla*.—Not present. *Stamens*.—Ordinarily 12 in 4 series, 1 series sterile. *Pistil*.—Single, with disklike stigma. *Fruit*.—Round, oblong, or pear shaped drupe, some as long as 7 1/2 inches; skin green or purplish, covering green and yellow, slightly

fibrous, nut-flavored, oily pulp, which encloses a large oblong or rounded seed covered with a papery brown skin and containing a milky juice. *Home*.—Tropical America.

POPPY FAMILY

(Papaveraceae)

Prickly poppy, puakala (*Argemone* species).—In his journal, 150 years ago, Captain Cook made note of having seen in Hawaii prickly poppies, which are native to America. They grow here in dry, rocky soil from sea coast to an elevation of about 1,000 feet, as conspicuous, attractive weeds one to four feet high. The coarse, prickly leaves alternating along the moderately prickly stem, which they clasp half way round, are deeply toothed. Mostly in February and March the white, delicate flowers bloom at the top of the plant. They open widely and disclose an orange center. From prickly pods about an inch long seeds are scattered that can resist fire, new plants springing up from ground that has been burned over recently. At the end of the season the plant dies. Formerly, Hawaiians used the plant for toothache, neuralgia, ulcers, because of the opium present.—On open, rocky waste land.

In Roman mythology the poppy is the symbol of Demeter, goddess of agriculture, harvest, and the earth. A mythologist explained this by saying that the roundness of the poppy suggested the world, its rippling edges the valleys and mountains, and the hollow center the caves of the earth.

Leaves.—About 9, coarse, prickly, deeply lobed, margins wavy and toothed, whitish, not stemmed, clasping half the diameter of the stem, juice yellow. *Flowers*.—Terminal, 2-3 inches in diameter, short stems or none. *Calyx*.—Sepals 2 or 3, prickly. *Corolla*.—Petals 4, delicate, rounded, white, tinted with

yellow at base. *Stamens*.—Orange, clustered thickly. *Pistil*.—Stigmas 4-6, red tipped. *Fruit*.—Capsule about 1 inch long, prickly, obovate or oblong, opening at top into short valves; seeds pitted. *Home*.—Mexico and other parts of North America.

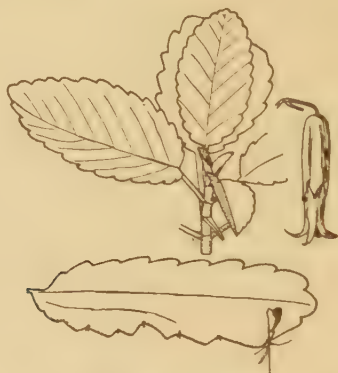


FIGURE 25.—Orpine family: air plant (*Bryophyllum calycinum*), leaves, sprouting leaf, flower.

ORPINE FAMILY

(Crassulaceae)

Air plant (*Bryophyllum calycinum* Salisbury). Figure 25.—An interesting but not very beautiful herb is the air plant, which is growing wild in many parts of Honolulu. Its reddish stem, which is marked with oblong light spots, rapidly reaches a height of two to four feet. From its fleshy, oval, scalloped leaves new plants can be grown, for if they are laid on moist sand or pinned to a wall the leaves and roots of new little air plants soon appear in the indentations of the scallops. This facility of propagation results in rapid multiplication of individuals. Though inconspicuous when not in flower, the air plant is attractive when its clustered cylindrical green and red flowers dangle from branches like little Japanese lanterns.—Manoa Road above Hastings Street, on bank; middle part of Tantalus road in Makiki district.

Leaves.—Opposite, fleshy, simple or ternate, oval, crenate, obscurely veined above; according to Bailey, absorption of oxygen at night and its release in daylight causes different flavors in the leaf, which is said to be sour in the morning, tasteless at noon, and bitter towards evening. *Flowers*.—Pendulous, in terminal compound panicles. *Calyx*.—Cylindrical, reddish-green, spotted with white, 1 1/2 inches long. *Corolla*.—Cylindrical, reddish green, spotted with white, 2 1/2 inches long, with 4 slightly curving tips. *Home*.—Mexico.

ROSE FAMILY

(Rosaceae)

Loquat (*Eriobotrya japonica* Lindley).—The loquat is a low evergreen tree 10 to 40 feet high, which is used both decoratively and as a fruit tree in China and Japan. In Honolulu it grows in several gardens. Near the ends of the branches are long, thick, toothed leaves, which are rusty-woolly underneath. Large, white, fragrant flowers grow in rusty clusters at the ends of branches, and the yellow, pear-shaped fruit, with a pleasant acid flavor and containing many seeds, ripens in clusters in December or January. The ancient Syrian town of Sidon is one of the places in Asia where the fruit is raised in orchards.—On hill above Kamanele Park beside Vancouver Highway.

Leaves.—Near the ends of the branches; thick, long, pointed, margined with short teeth, rusty-woolly beneath. *Flowers*.—In terminal rusty-woolly clusters, white, fragrant, large. *Calyx*.—Thick, 5-toothed. *Corolla*.—Petals 5, margins scalloped. *Fruit*.—In clusters, yellow, pear shaped, with pleasant acid flavor; seeds large, many. *Home*.—China, Japan.

Roses (*Rosa*, several species).—Honolulu is not a favorable place for roses. The warm climate prevents favorite hardy kinds from growing well, while tender kinds, like the tea rose, which formerly thrived here, are destroyed by the "Japanese" rose beetle, a pest of recent introduction. A way has been found of preventing the ravages of this pest; but it is rather impracticable. As the beetles work in the dark for only a short time in the evening, plants can be protected by artificially lighting them until about ten o'clock. A few roses thrive without this protection, however, as one of the China roses, a luxuriant hedge of which can be seen at 2211 Nuuanu Avenue, just beyond the cemetery.

The Chinese and the American Indians have similar legends explaining that thorns were given to the rose to protect it. A Christian legend tells of little Madelon who followed the shepherds to the manger where the Christ Child lay. When Madelon wept because she had no gift, an angel appeared, and from the earthen floor where the tears fell white roses sprang up, which Madelon presented to the babe. When Aphrodite hastened to her lover she stepped on a white rosebush, the thorns wounded her feet, and her blood dyed the roses red. From that day red roses have bloomed.

At the time of the Armistice it was recorded that a rosebush producing pink roses that shaded into blood-red suddenly blossomed with roses as white as the dove of peace. The rose is the national emblem of England, and it is the flower of the island of Maui.

BEAN FAMILY

(Leguminosae)

MIMOSA SUBFAMILY

(Mimosoideae)

Elephant's ear, earpod (*Enterolobium cyclocarpum* Grisebach). Plate XXII, *B*; Figure 26, *a*.—An American member of the pea family that should lead in the grand march of that group so well represented in Honolulu, is a wide-spreading tree, the elephant's ear. Its proportions are tremendous, branches as well as trunk being immense, and it is consequently generous with shade. Above the surface of the ground around its base lie many roots. Its large size and also the somewhat rough texture of the gray bark suggest an elephant. But the cause of the popular name is the dark-brown, shining pod, which is circular and flat, except for slight elevations marking the position of the seeds. The seeds also are dark-brown and are used in leis. A surprising contrast to the huge tree that bears them are the myriads of extremely fine, lacy leaves. During April and May appear white flowers crowded in small round heads.

The tree is not only ornamental and furnishing shade; but parts of it are employed in several ways. In Mexico, use is made of the fruit, the pods serving as cattle feed, the seeds and young pods as human food; and use is made of the wood, which is hard and elastic and withstands water, for canoes and water troughs, besides cabinets. From the bark, tannin is extracted, and in Venezuela, bark and fruit are used as soap.—Thomas Square; park at Keeaumoku and King streets.

Leaves.—Bipinnate, 4-9 pairs of pinnae; leaflets, 20-30 pairs, pointed, unequal sided, nearly 1/2 inch long, whitish beneath. *Flowers*.—White, many, in small, round heads. *Calyx*.—More than half as long as the corolla, downy. *Corolla*.—Funnel shaped, 5-toothed. *Stamens*.—Many, white, united at base. *Fruit*.—Pod, dark-brown, shining, circular, 3-4 inches in diameter; seeds, 16 or more, dark-brown, nearly 1/2 inch long. *Home*.—Jamaica (Kew Index); Jamaica, Venezuela, West Indies, Central America (Rock).

Opiuma, inga, Madras thorn, snake-jaws (*Pithecolobium dulce* Bentham). Figure 26, *b*.—A native of America that is cultivated in many tropical countries is called “opiuma” or “inga” in Hawaii, “Madras thorn” in Ceylon, where it is used in hedges and as a shade tree. It grows easily, is common in town, and is found in wild places due to distribution of seeds by birds. This medium-sized tree has been recommended for use in landscape gardening for its attractiveness. Its wide-spreading, thorn-armed branches hang low and sway gracefully in the trade winds, somewhat like the *kiaue*. However, the bark, smooth and light-gray, and the leaves, which consist of two pairs of pale, evergreen, leathery leaflets, are distinctly different.

The flowers are small and white and grow in round heads in clusters, from which bees make good honey. Many smooth, red, swollen pods, which twist spirally, develop from them, ripening in April, May, and June. Then the pods burst open along the sides, and a thick mass of white, spongy, sweet-tasting pulp is disclosed—a satisfactory explanation for *dulce* in the scientific name. The remainder of the name means “monkey” and “pod.” The ripe pulp, which is pleasant tasting, is used for fodder in Mexico and is also sold there in the markets for food and for making a drink like lemonade. In the pulp are embedded flat, black seeds, which are used in leis. These seeds resemble the opium of commerce, hence the Hawaiian name “opiuma.” The wood is strong and flexible and furnishes good lumber for building.—Kamanele Park.

Leaves.—Bipinnate, 2 pinnae, each with a pair of leaflets, blunt, smooth, pale-green, leathery, 1-3 inches long. *Flowers*.—Whitish or yellowish, packed in small, round heads in terminal racemes. *Fruit*.—Pod, smooth, red, swollen, downy, spirally twisted, dehiscent; 8 flat, black, circular seeds embedded in white or reddish sweet-tasting pulp. *Home*.—Tropical America.

Monkeypod, rain tree, ohai [*Samanea saman* (Jacquin) Merrill]. Plate XXIII, *A*.—A beautiful and favorite shade tree, well known in many tropical countries and believed to have originated in America, is the monkeypod. It rivals the banyan and elephant's ear in spread and height, rapidly reaching its full height, especially near water, some trees being as much as 75 feet high. The leaves ordinarily form a dome-shaped canopy one layer thick over the tree. They are compound, and, as is the custom of leaves on many leguminous plants, they close in the late afternoon for the night. In February and March they drop, and many trees are nearly or entirely bare before the new ones unfold, which have a contrasting fresh green

FIGURE 26.—Bean family, mimosa subfamily: *a*, elephant's ear (*Enterolobium cyclocarpum*), showing position of pinnae, leaflets closing, buds, pod; *b*, opiuma (*Pithecolobium dulce*), leaf, flowers, green pod; *c*, *klu* (*Acacia farnesiana*), leaves, flowers, pod; *d*, siris tree (*Albizzia lebbek*), closed leaf, new and old flowers; *e*, false koa (*Leucaena glauca*), young leaves, flowers, pods; *f*, algaroba (*Prosopis juliflora*), leaf, flowering spike, pod.



color in comparison with the yellowish-green of the old foliage. When the leaves are thin, the numerous black pods (on some green) are most conspicuous. They never open voluntarily and contain many seeds, which are surrounded by a sticky pulp. Most of the pods hang on the tree through the year until flowering time, when they sometimes drop in a short period in great numbers. The flowers, growing in thick tasseled heads, thickly dot the green leafy canopy with pink, especially in May and June, less abundantly in April, July, August.—Lawn of Public Library; Moanalua Gardens; Nuuanu Stream at School Street.

Leaves.—Bipinnate, pinnae 4-6 pairs; leaflets 3-8 pairs, $3/4$ - $1\frac{3}{4}$ inches long. *Flowers.*—Pink, in thick tasseled heads in axils or near end of branches; each 5-parted. *Calyx.*—Cut slightly. *Corolla.*—Joined in a tube to middle. *Stamens.*—Many, joined at base, extending far beyond petals. *Fruit.*—Pod straight, black, thick, thickened at the junction, indehiscent, 6-8 inches by $3/4$ inch, many; seeds slightly flattened, oblong, many, surrounded by sweet, sticky pulp. *Home.*—Central America or northern South America, West Indies.

Siris tree, white monkeypod, woman's tongue [*Albizia lebbek* (Linnaeus) Benth]. Figure 26, *d.*—The siris tree is fairly common in Honolulu. In Egypt it is planted in avenues for shade and ornament. It is medium to large sized and is useful as a shade tree because of its spreading branches. The pods are its most distinguishing feature, not only because of their large size, tan color, and abundance, but also because they hang on the tree from December to May or longer. Some years the leaves are absent during this time, when the trees resemble oaks in the northeastern States with their tenacious winter covering of dead, dun-colored, rattling leaves. The siris pods rattle similarly, like the clatter of women's tongues, they say in the Philippines. As each of the many pods contains several seeds, the tree is quite prolific. The bark is dark-gray or brown and cracked; it produces much gum. The leaves are smooth, shining, compound, and the flowers are in large, pale-green, tasseled heads, which grow in clusters near the ends of branches. As the flowers are like those of the monkeypod, the popular name "white monkeypod" has arisen. Looking like pompons, they load the trees in May and early June on single trees for only a few days, but do not pass before giving a profuse showing and generously perfuming the surrounding air. The siris tree has been planted throughout the Tropics, particularly in northern Africa. It prospers up to 5,000 feet, grows rapidly, does not object to poor soil,

and supplies good firewood.—Makiki Street, above Nowewehi Street; Kewalo Street near Lunalilo Street; grounds of Central Grammar School.

Leaves.—Bipinnate, alternate, large, main stem up to 9 inches long; pinnae 2-4, paired; leaflets 5-9 pairs, smooth, shining, short-stemmed, oblique, oblong, blunt, 1-2 inches by $1\frac{1}{2}$ - $\frac{3}{4}$ inch, having a network of veins. *Flowers*.—Greenish-yellow to white, in panicles of large, short-stemmed, tasseled heads (1-4 together) near outer ends of branches, fragrant. *Calyx*.—Tubular, nearly smooth, 5 triangular lobes, $\frac{1}{6}$ inch long. *Corolla*.—Bell shaped, twice as long as calyx; petals split to near middle, 5. *Stamens*.—Many, $\frac{3}{4}$ inch long, extending far beyond petals in a tassel, bases joined. *Home*.—Tropics of Eastern Hemisphere.

Albizzia [*Albizzia saponaria* (Loureiro) Blume].—Of another albizzia, few trees are found in Honolulu. An attractive one stands near the side entrance to the Queen's Hospital, and when covered with dainty, light, fluffy flowers early in the spring it is lovely to behold. It is an open-forest tree of the Philippines and Malay. Though similar in general appearance to the siris tree, it differs as follows: in the leaves the pinnae are paired, leaflets are much larger and downy; flowers are white and grow from the ends of the branches (in March); pods are smaller. Also, its growth is much slower.

Albizzia [*Albizzia marginata* (Lamarck) Merrill].—Among the varied and interesting assortment of trees in the park at the corner of King and Keeaumoku streets is a tall albizzia that blooms in April, when whitish clustered flowers thickly dot the crown. Its bark is pale-gray, thin, and nearly smooth. It is similar to the siris tree, but has finer leaves, the leaflets being not only much smaller but more numerous. They are also sensitive, downy, and pointed, the young ones golden-yellow. The pods are a little smaller than the leaves, are pale-brown, and contain about a dozen seeds. In India this albizzia lives as high as 4,000 feet. It is easy to cultivate, growing fairly fast, and furnishes shade. In Hawaii it is used a little for reforestation.—Pacific Heights.

Leaves.—Bipinnate, 6-20 pairs of pinnae; leaflets, 20-40 pairs, about $\frac{1}{4}$ by $\frac{1}{12}$ inch, sensitive, downy, pointed, young ones golden-orange; stipules large, persistent. *Flowers*.—In axillary or terminal racemes; see *A. lebbek*. *Fruit*.—Pod, 6-8 by $1\frac{1}{4}$ inches, pale-brown, short stalked, 8-12 seeded. *Home*.—India.

Haole lehua (*Calliandra haematoma* Benth).—Because the flower resembles that of their native lehua and was brought in by the white man, Hawaiians call a red-flowered calliandra “haole lehua.” “Calliandra” is Greek for “beautiful stamens,” the long, silky stamens being the conspicuous part of the flower. The plant is a slow-growing shrub with many branches, bearing leaves divided into two parts, each of which consists of several small paired leaflets. Several seeds are borne in the narrow pod, which is about two inches long. Though not common in Hawaii, the *haole lehua* has been here for many years. Several shrubs of a pink-flowered calliandra are also growing in Honolulu.—1727 Makiki Street (red); grounds of Territorial Building (pink).

Leaves.—Bipinnate; 2 pinnae, paired, rhachis 2-3 1/2 inches long; leaflets 8 pairs, increasing in size upwards, lowest pair 1/3 inch long, uppermost pair 1 1/3 inches long and about 1/3 inch wide, oblong, blunt at apex, tipped with a point, unequal at base and unequally halved by midvein, hardly stemmed; common stem nearly 10 inches long, woody. *Flowers*.—At tip of branchlets, in large, round, red, showy heads; peduncles about 1 1/2 inches long. *Calyx*.—Tiny, lobed, downy, prominently veined. *Corolla*.—Blood-red, tiny, tube, 1/10 inch long, lobes a little shorter, downy, distinctly veined, concealed by stamens. *Stamens*.—Much exserted, many, nearly 1 inch long, united in tube 1/3 their length, red. *Fruit*.—Pod about 2 1/3 inches by 1/4 inch, margin thickened (not thickened in *Acacia*); seeds several. *Home*.—Tropical America.

Australian blackwood (*Acacia melanoxylon* R. Brown).—On Tantalus a slow-growing hardwood tree has been planted rather extensively. In rich, damp soil in Australia it becomes a giant, reaching a height of 80 feet and a diameter of several feet. Many trees in Hawaii have not been planted long enough to reach their full height.

In many ways the blackwood resembles the koa, but it grows more slowly and is less attractive. It has straighter and shorter “leaves,” narrower pods, and the branches ascend to form a pointed crown. Though the wood is less valuable than koa wood it is very good, being used in Australia for furniture, boats, railroad cars, and is said nearly to equal walnut in quality and to excel the New Zealand kauri.—Tantalus road.

Leaves.—Wanting. *Phyllodia*.—Leaf stems functioning as leaves, flat, sickle shaped, as much as 4 by 1 inch, leathery, narrowing towards base, blunt, several longitudinal veins. *Flowers*.—In round heads, single or many together, with 30-50 flowers, pale-yellow or dirty-white. *Fruit*.—Pod, perhaps curved in a circle, 1/4 inch wide, edges thickened; seed nearly round, with red stalk of ovule doubly encircling it. *Home*.—Australia.

Koa (*Acacia koa* Gray). Plate XXIII, B.—The monarch of Hawaiian forest trees is the koa. In strength, in height, in appearance it is superior. Its height of 50 feet or more, which is attained slowly, and its far-spreading branches combine to produce a large majestic tree. It is common on mountain sides, chiefly between 1,500 and 4,000 feet elevation, and there its round dark-green crown is a characteristic feature of the landscape. Where growing together under perfect conditions, which seem to be near the higher limit, the trunks are tall and straight for as great a height as 60 feet before any branches begin, and one with a diameter of 10 feet is not difficult to find. At high elevations on the Island of Hawaii this is especially true today and was also true in the past, as is evidenced by fossils. Lava flowing down the slopes of Mauna Loa buried whole forests, and now near Kilauea Crater deep well-like holes can be found which are casts of giant koas, the wood of which burned or rotted away long ago. Flows destroyed the trees in ancient times; in modern times other causes, as cutting and burning, are reducing their numbers even more rapidly. Where growing alone or mixed with lower plants the koa has wider spreading branches beginning low down on the trunk.

The bark is light-gray, smooth on young trees, on mature trees considerably furrowed longitudinally. Its smooth, stiff, crescent-shaped "leaves" are broad leaf stems functioning as leaves. Looking up at them from below, one sees a dancing fretted canopy of millions of tiny new moons. Real leaves can be found on young trees and near the base of older ones, and they are finely divided and almost lacy. In late winter and early spring the crown of leaves is whitened by small balls of clustered flowers, many of which develop into thin pods.

Koa wood is used extensively in Hawaii and is called "Hawaiian mahogany." When it is polished it has a beautiful red color in which wavy lines show. While now it is used for furniture, woodwork, ukuleles, novelties, it formerly was carved by Hawaiians into many forms, as war canoes, surf boards, and calabashes, and was then as now perhaps the most valuable lumber tree in Hawaii.—Dowsett Tract; Oahu Avenue near Kaala Avenue.

The koa is well known as the crescent-leafed tree from which Laka made his canoe. When as a boy he wanted a canoe so that he might go in search of his father, his grandmother told him to

go to the woods and find a tree with crescent leaves. Laka felled a koa; but the next day it had been reerected. This happened three times, and at last Laka decided to sleep under his tree. Far off he heard the humming of the menehunes, the Little People of Hawaii. When they came nearer Laka caught a menehune and threatened to kill him. The other menehunes fled; but the little man promised Laka they would build and launch a canoe for him if he would spare his life. Laka found that his father had been killed; but with his menehune canoe he became a famous fisherman.

On Kauai a mythical koa was supposed to be growing without roots.

The *elepaio*, a shy little bird still to be found in the woods, was the determining factor in the choice of a koa tree for a canoe and was said to be the god of canoe builders. If an *elepaio* pecked at several places on the fallen trunk, it was rejected by the kahuna of the canoe builders.

Leaves.—On young trees and at base of older ones, bipinnate, 5-7 pairs of pinnae, short-stemmed; leaflets 12-24 pairs, 1/4 inch long, oblong, pointed; stem margined or winged, downy, 6-7 inches long. *Phyllodia*.—Leaf stems functioning as leaves on older trees, flat, sickle shaped, leathery, narrowing towards base and tip, 5-8 prominent longitudinal veins, 4-7 by 1/6-1 inches. *Flowers*.—White, in dense, round heads, about 1/3 inch in diameter, alone in upper axils or several in axils on stems 1/2 inch long, 3-5 in clusters on stem 3-6 inches long. *Calyx*.—Top shaped, with 5 short blunt downy teeth. *Corolla*.—Petals 1/3 longer than calyx, 5. *Stamens*.—Many. *Fruit*.—Pod, straight or slightly curved, 6 by 1 inch, smooth, thin, flat, ends blunt, margins not thickened; seeds 12, flat, dark-brown to black. *Home*.—Hawaii.

Black wattle (*Acacia decurrens* Willdenow).—On Tantalus a useful as well as ornamental tree has been planted which hails from Australia—the black wattle. At home large examples reach a height of 60 feet, a diameter of 2 feet. But ordinarily the dimensions are rather small.

Dry, poor soil is not feared by this tree but instead is considered a favorable condition. Though it prefers more fertile ground it will grow well and rapidly in quite barren places and in so doing affords shelter for the raising of forests of other kinds of trees. It is fairly hardy, enduring lower temperatures than even *Eucalyptus globulus*. In Hawaii it is short-lived; but suckers producing new plants are sent up freely from the roots.

The more or less smooth bark of the black wattle is the golden egg it lays. For besides producing a valuable gum resembling gum arabic, it is rich in tannin. In fact it is one of the most important tannin-yielding trees known. The quality is excellent, and the quantity is considerable, a quarter of a ton of bark coming from some trees. An Australian legend states that the first man had his beginning in the gum of the wattle and he stepped from a knot in the trunk.

The branches are angled, some seemingly winged. The leaves are finely divided, and crowded together in small round heads at the ends of the branches are the very fragrant flowers, which in Australia come late in the spring. The pods, which do not ripen in less than 14 months, have a beaded appearance, consisting of alternate swellings, where the seeds lie, and constrictions. The wood is used for turners' work and for fuel.—Tantalus road.

Leaves.—Bipinnate, 8-15 pairs of pinnae; leaflets, 30 or more pairs, up to 1/2 inch long, narrow, rather distant. *Flowers*.—About 20 in small round heads in axillary and terminal racemes, whitish-yellow, fragrant. *Fruit*.—Pod, about 3 1/2 by 1/4 inch, constricted between the seeds, narrower than pods of silver wattle; seeds smaller, shorter, rounder than those of the silver wattle. *Home*.—Australia.

Silver wattle [*Acacia decurrens* var. *dealbata* (Link) F. von Mueller].—The silver and black wattles have much in common besides the same home. But they can be distinguished easily where seen growing together. The silver wattle is larger, in Australia some trees reaching a height of 150 feet, and it is less adaptable to environment, at home decidedly if not exclusively preferring damp river banks to barren places. The bark is thinner and inferior in quality, and the foliage is quite distinct, appearing frosted, as also do the branches. The leaflets are considerably smaller, and the flowers come earlier. The pod is more frosted and not constricted, and the seeds, which are larger and longer than those of the black wattle, ripen much quicker—in about five months. Also the silver wattle forms clumps, new stems coming up from the roots. The timber is used by coopers, and the wood makes good fuel.—Tantalus road.

Leaves.—Bipinnate, 10-20 pairs of pinnae; leaflets 30-40 pairs, about 1/5 inch long, narrow, crowded, silvery or ashy hue on young foliage. *Flowers*.—In small heads in axils or at ends of branches, fragrant. *Fruit*.—Pod, 1/3 inch wide, much frosted, with few or no constrictions between seeds, flat. *Home*.—New South Wales and Tasmania.

Klu, aroma, opopanax, popinac [*Acacia farnesiana* (Linnaeus) Willdenow]. Figure 26, c.—A thorny shrub widespread in Hawaii and known as *klu*, is almost as common as the *kiawe*. It grows like a weed in places where it is not desired, as well as in barren places and on roadsides. It is also found in tropical America, in northern Australia, and southern Asia. Though most are not very tall, some plants are treelike, reaching a height of 12 feet or more. The branches are angular, and from them and the main stem can be procured considerable gum, from which, it is said, is produced a glue (*klu*) better than gum arabic. The finely divided leaves and green pods are grazed by stock; but the plant is perhaps best known for its sharp thorns, its flowers, and its ripe pods. The plants have been raised commercially for the sake of the orange-yellow balls of flowers, "cassie flowers," which with their penetrating, rather pleasant odor, yield perfumery. In southern France they are raised successfully for this purpose. Though attempted in Hawaii the industry did not prove successful, as the flowers, which are light, brought only 80 cents a pound. In tropical America the flowers are much used; they are put away with linen to scent it: an ointment for headache is made from them and also an infusion for dyspepsia. The brownish, swollen pods are abundant, and they furnish tannin good for dyeing, making ink, and tanning, the green fruit an astringent of use medicinally.—In waste fields.

Leaves.—Bipinnate, 2-3 inches long; pinnae 5-8 pairs; leaflets smooth, oblong, 10-40 pairs, not exceeding $\frac{1}{4}$ inch in length. *Flowers*.—Orange-yellow, in round, axillary heads on inch-long downy stems singly or in bunches, strong smelling, about $\frac{1}{3}$ inch in diameter. *Fruit*.—Dark-brown or purplish, downy, swollen, pulpy pod, about 2 inches by $\frac{2}{5}$ inch, constricted between the seeds, straight or curved, indehiscent. *Home*.—Tropical America (Rock); tropical regions (Kew Index).

Acacia (*Acacia catechu* Willdenow).—An acacia planted to some extent in Hawaii is valuable because it does not object to dry places and will grow rather high, in its home land to 3,000 feet. Another point in its favor is that it is probably avoided by white ants. It is a medium-sized tree, not exceeding a height of 40 feet, and spines may be present. The bark, brown and cracked, yields a yellow, sweet gum, from which is obtained the astringent extract of medicine, catechu, or cutch of the tannery. According to one authority, one ton of cutch is obtained from four tons of bark. The many leaves are finely divided, and they drop in winter.

Pale-yellow flowers grow rather densely in long spikes, and from them a flat, leathery pod develops.

As the wood of this acacia is used in making the sacred fire of India, the tree is highly esteemed there. A sprig placed over the bed or worn in the turban is said to ward off evil. Not even a wizard would dare to approach this sacred tree, which sleeps at night and is alive all day. It is said to withdraw its leaves if anyone tries to touch them.—Tantalus; Hillebrand Gardens.

Leaves.—Bipinnate; mid-stem 6 inches long or more, smooth or downy, some with glands; pinnae 8-40 pairs; leaflets 30-50 pairs, not more than 1/5 inch long and half as wide, downy. *Flowers*.—In axillary spikes, solitary or in twos or threes, rather dense, pale-yellow, each 2-5 inches long, downy. *Calyx*.—Bell shaped, acutely 5-toothed, woolly. *Corolla*.—Nearly twice as long as the calyx, petals 5. *Stamens*.—Many. *Fruit*.—Pod, flat, short-stemmed, 3-4 3/4 inches by 3/4 inch, leathery, smooth, shining; seeds 6-8. *Home*.—India.

False koa, jumpy-bean, lead-tree, wild tamarind, horse tamarind, koa haole, ekoa, ipilipil (*Leucaena glauca* Benthani). Figure 26, *e*.—The false koa is a common roadside shrub that here and there becomes a small tree. It forms dense thickets. It has spread from tropical America to all tropical lands, in Hawaii preferring lowlands and lower mountain slopes and not being averse to populating barren places. In some countries it is planted as a shade tree for coffee. The bark of the false koa is somewhat scaly and dark-brown. The leaves closely resemble the true leaves of the koa, while the flower heads are somewhat longer stemmed and larger than those of the koa. The pods, which hang in clusters, are similar, but contain more seeds, which are oblong and dark-brown. In Hawaii they are strung together for leis; in the West Indies they are a source of food, both pods and seeds being eaten with rice. In tropical America it is said that if they eat any part of the plant, horses, mules, and pigs will lose their hair. Cattle relish the foliage and are not affected by it, and in Mauritius it is considered good fodder for goats.—Makiki Valley.

Leaves.—Bipinnate, 4-12 inches long, 4-8 pairs of pinnae; leaflets 10-20 pairs, 2-3 1/2 inches long, oblong, narrow, acute, 1/4-1 1/2 inch long, white below; stems powdery. *Flowers*.—Small, white, crowded in round long-stemmed heads 3/4-2 inches in diameter. *Calyx*.—Five-toothed. *Corolla*.—Petals 5, free. *Stamens*.—Not glandular, 10. *Fruit*.—Pod, smooth, papery, thin, flat, brown, straight, stalked, pointed, 4-6 by 1/2 inch, 2-valved, clustered; seeds oblong, flat, brown, shining, 15-25 in a pod, where they lie transversely. *Home*.—Tropical America.

Sensitive plant, humble plant (*Mimosa pudica* Linnaeus).—On open spots beside the road or path one can sometimes find the sensitive plant, a low, branching herb that spreads over the ground for as much as two or three feet. From tropical America it has migrated to all tropical countries and in Hawaii has won the enmity of agriculturists by becoming naturalized in cane-fields, though in places it is useful for binding sandy soil.

It is slightly woody at the base and the stems are somewhat prickly, having many bristly hairs, which bend backwards. The leaves are of unusual interest, for they are animated, and on account of this oddity are cultivated in some places. They are divided into small, narrow leaflets, which when touched quickly close, those on the youngest leaves with the greatest speed. Some time later they slowly open. Such sensitiveness in plants is a sign of sacredness to some races. Small, pink, round heads of flowers are borne on long stalks, one to three together. They are prolific, in many pods few seeds being borne. The root is used as an antidote for cobra bites.—Country roadsides; paths, as trail beyond upper end of Pacific Heights road.

Greek legend tells of Cephisa, a lovely, modest maid, who was wooed by Pan. His love was most unwelcome and she fled from him. When he overtook her she prayed to the gods, who in pity turned her into the mimosa, whose leaves shrank from the hands of Pan as they do from human touch today.

Leaves.—Bipinnate, 1-2 pairs of pinnae; leaflets 15-25 pairs, oblong-linear, pointed, ciliate, drawing back and folding up, as do pinnae, when touched; stem long. *Flowers*.—Pink or purplish, crowded in small round heads about 1/3 inch in diameter, on long stalks, 1-3 of which arise in axils; petals and stamens 4 or 5. *Fruit*.—Pod, many, flat, up to 3/4 inch long, each with 3-5 one-seeded joints, which fall off when ripe, leaving a suture bristling with yellowish-white hairs. *Home*.—Brazil.

Kiawe, algaroba, mesquite [*Prosopis juliflora* (Swartz) DeCandolle]. Plate V, XXIV, *B*; figure 26, *f*.—The algaroba, locally known as the *kiawe*, is a fairly large tree, seldom reaching a height of 60 feet, with sinewy trunk and branches and widespreading crown. It is the commonest and most valuable of introduced trees and has many uses: the pods for fodder and by American Indians for food; the wood for fuel; the lumber for piles, as it is not attacked by the boring mollusk, the teredo; the flowers for honey; the tree for reforesting dry waste places, like the island of Kahoolawe. It thrives

as high as 2,000 feet and not only grows easily and propagates itself, but grows quickly. Though it comes from tropical America, the parent of all Hawaiian algarobas was raised from a seed from the Royal Gardens in Paris. In 1828 Father Bachelot planted it at the Catholic Mission on Fort Street, where the stump may be seen today. It has been moved from its original location.

The trees vary considerably in shape and size, but the branches of all are long and slender and either droop gracefully or fling their fine evergreen leaves in the breeze. Unfortunately, owing to shallow roots mortality is high among algarobas during wind storms, many being blown prostrate. In some countries they grow extraordinarily deep, 60 feet being reported for one tree. The bark is gray and on mature trees is longitudinally furrowed. Young trees and branches are smooth, except where thorns are present, which are abundant on the youngest branches. The bark contains tannin and also a gum good for varnish and glue and medicinally for dysentery and a gargle. The flowers are pale-yellow and tiny and are borne on long, cylindrical spikes, mostly in February and March. On the island of Molokai they are the source of a product which is popular in the States—a delicious honey, nearly 200 tons of which are produced a year and shipped not only to the United States but to Europe. The wax is melted into cakes and is also shipped.

The stiff yellow pod somewhat resembles a wax bean in shape and size, and raised places on it show the position of the seeds, which are embedded in a sweet gummy pulp, containing about 25 per cent grape sugar. Annually in Hawaii about 500,000 bags are gathered.—Punahou campus; grounds of Bishop Museum; Ala Moana.

Leaves.—Bipinnate, pinnae in 1 or 2 pairs; leaflets fine, smooth, 6-30 pairs, 1/4 inch or longer, linear or oblong. *Flowers*.—In cylindrical axillary spikes 4 inches long or more, pale-yellow; individuals about 1/10 inch long. *Calyx*.—Bell shaped, toothed, 5-parted. *Corolla*.—Petals 5, joined nearly half way up, many woolly inside the tip. *Stamens*.—Ten, extending a little beyond the petals. *Fruit*.—Pod, linear, compressed or nearly cylindrical, straight or curved, 2-8 inches long, 1/6-1/2 inch wide, indehiscent, position of seeds shown by swellings; seeds oval, flattened, embedded in sweet, gummy pulp. *Home*.—Tropical America.

False wiliwili, red sandalwood tree (*Adenanthera pavonina* Linnaeus).—Scattered fairly commonly through Honolulu is the false *wiliwili*, a slender tree about 25 feet high and rather wide-spread-

ing, the branches being high on the trunk. In Ceylon it is taller and has larger leaves than in Honolulu. The bark is pale-gray, nearly smooth. Though the tree is not particularly admired for its appearance, the wood is valued for its strength and durability. In Asia it is called "red sandalwood" because it is used as a substitute for the real sandalwood. In Hawaii it is called "false wiliwili," though it is quite different from the genuine *wiliwili*. The leaves, especially, are different, being finely subdivided. In winter and early spring, the foliage becomes quite thin. The flowers are small, yellow, and sweet, and they bloom inconspicuously in clusters.

An interesting product is the seeds, called "Circassian seeds"—scarlet, flattened, round—one of the commonest kinds of seeds used in leis. In Asia they are eaten, and they are also used as weights by gold- and silversmiths, for their weight is uniformly nearly four grains. They form in thin-shelled pods, which are brown outside and straw-yellow and satiny inside and on opening become twisted. It is said that Hindus make sectarian marks on their foreheads with a dye obtained from the wood.—Punahou Park; Thomas Square; Capitol grounds, Richards Street.

Leaves.—Bipinnate, 8-12 inches long; pinnae 3-6 pairs, opposite; leaflets 6-12 pairs, alternate, oblong, about 1 inch long. *Flowers*.—Small, yellow, sweet, in axillary paniced racemes. *Calyx*.—Small, bell-shaped, with short tips. *Corolla*.—Petals 5, united at base. *Stamens*.—Free, not longer than petals, 10. *Fruit*.—Pod, 4-12 inches long, nearly $\frac{3}{4}$ inch wide, brown outside, yellowish inside, thin, after opening by its 2 valves becoming twisted; seeds lens shaped, round, shining, scarlet, 8-10 in a pod, $\frac{3}{8}$ inch in diameter. *Home*.—Tropical Asia, Malaysia.

SENNA SUBFAMILY

(Caesalpinioideae)

Tamarind (*Tamarindus indica* Linnaeus). Figure 27, *b*.—The scientific name of the tamarind is compounded of *tamar*, "date" and *indus*, "Indian," referring to the interesting product of the tree, the pod. This is velvety, reddish-brown, and thick, and its brittle shell never opens voluntarily. It encloses a few seeds embedded in a thick, sticky pulp, from which a pleasant-tasting syrup is made for use in drinks, also in curries and chutneys. In remote Sanskrit time it was used medicinally. This pulp, which contains sugar and three acids: acetic, tartaric, and citric, not only has cooling and laxative properties but is also used as a gargle. Many pods are exported

from the East to Europe, the pods previously having been dried in the sun, cured in salt water, or preserved in sugar.

This slow-growing tree has long been common in Honolulu. At the upper end of Fort Street on what was formerly the Booth estate is one said to have been planted in 1797 by Don Marin. If able to trace its origin, it would probably claim tropical Africa as its home, possibly also tropical Asia, where it grows in dry places and in jungles. It is common in villages, as it is a favorite because of fruit and shade. At home it reaches a height of 80 feet and a large diameter. In Hawaii it is medium sized. It has open, spreading branches and graceful, feathery foliage, which is evergreen and in India is the source of a yellow dye. The brownish-gray bark is nearly smooth, and the surface is covered with thin flakes. The wood makes good charcoal for gunpowder.—Lawn of Kawaiahae Church; grounds of Judiciary Building; corner of Judd Street and Nuuanu Avenue.

The Hindus sometimes marry a tamarind to a mango tree with all the formality of a real marriage before they eat any of the mangoes. The sacred tree of the Bambaras of the upper Niger is generally the tamarind. In upper Burma the people of one village choose a large tamarind as the abode of the rain god, to which they offer sacrifices and hold a festival to bring rain.

Leaves.—Pinnate, 2-3 1/2 inches long (in Africa up to 6 inches long); leaflets, 10-20 pairs, opposite, oblong, obtuse, 1/2 inch long. *Flowers.*—In terminal or lateral racemes 2-4 inches long. *Calyx.*—Not half an inch long, receptacle cone shaped, 4 yellowish sepals. *Corolla.*—Yellow with pink stripes, 1 inch across; petals 5, oblong, the middle 1 narrowest, 2 lower small and scaly or bristly and hidden. *Stamens.*—Three fertile ones united nearly to apex, 6 unfertile small. *Pistil.*—Long. *Fruit.*—Pod, 2-5 by 3/4-1 1/4 inches, velvety, red-brown, thick, oblong, brittle shelled, sides flattened, indehiscent; pulp brown, thick, acid, juicy; seeds round or oblong, brown, 4-7. *Home.*—Asia and tropical Africa.

St. Thomas tree (*Bauhinia monandra* Kurz). Figure 27, *a*.—A common, small tree, with leaves resembling the wings of a large green butterfly, differing from the very compound leaves common in the pea family, and with dainty, pink, orchid-like flowers, adds to the variety and beauty of the flowering trees in Honolulu. It is called the "St. Thomas tree." The bark is gray and smooth. Its lower, horizontally spreading branches and upper more nearly erect ones form a skeleton for a somewhat semicircular crown of dense

foliage. The leaves gave rise to the name, the twin leaflets suggesting twin brothers, John and Caspar Bauhin, who were herbalists in the eleventh century, and after whom Linnaeus named the genus. The flowers, somewhat like those of the poinciana, usually make a big display. In March or April and for some time afterwards they continue to come out a few at a time, while long, broad, and rather thick pods are developing. The pods are also smooth and regular shaped and when green or brown add an attractive feature, while hanging vertically from the branches. The tree grows well on dry soil, and on the island of Hawaii reaches especially splendid development on exposed lava flows in Kona by the shore at Honaunau.—1426 Alexander Street; Keeaumoku Street, near Hawaiian Sugar Planters' Experiment Station; Beretania Street near Punahou Street.



FIGURE 27.—Bean family, senna subfamily: *a*, St. Thomas tree (*Bauhinia monandra*), leaves, flowers, pod; *b*, tamarind (*Tamarindus indica*), leaf and fruit.

Leaves.—Rounded, two-lobed, being split about half way to base, reaching a length and width of 5 inches, distinctly veined. *Flowers*.—In axillary racemes consisting of a few pinkish flowers. *Calyx*.—Split to base on one side, 1 inch long. *Corolla*.—Four inches in diameter, petals 5, spreading, 4 petals narrow on lower half and broad on upper half, pinkish-purple,

dotted with dark spots; 5th upper petal ovate, dark, mottled. *Stamens*.—One, as long as pistil. *Fruit*.—Pod, some as long as 8 inches and 1 inch wide, rather thick, smooth, shining; seeds compressed, ovate. *Home*.—Probably tropical America (Rock); Burma (Kew Index).

Bauhinia (*Bauhinia tomentosa* Linnaeus).—An attractive bauhinia is a shrub growing as high as 15 feet and having slender, drooping branches. The leaves are smaller than those of its larger relative, the St. Thomas tree, and not so deeply cleft, and the bark is yellow-gray and furrowed longitudinally. The flowers are yellow, drooping, and bell-shaped, never opening wide. Leathery, flat, sharp-tipped pods develop from them, each containing about a dozen oval, shining seeds. From tropical Asia this shrub is distributed to tropical Africa, being common in dry regions. In the Orient it flowers twice a year, in Honolulu much of the year.—Punahou Park.

Leaves.—Similar to those of *B. monandra* but smaller, some 3 inches broad; cleft about a third of the way to base, tips rounded, slightly whitish beneath. *Flowers*.—Yellow, drooping, single or paired in axils of branches, bell shaped, 2 inches long. *Calyx*.—Funnel shaped, 1/4 inch long or more, downy, split down one side. *Corolla*.—Petals 5, 1-2 1/2 inches long, overlapping, rounded, narrow at base. *Stamens*.—Of unequal length, 10. *Pistil*.—Filament up to 3/4 inch long. *Fruit*.—Pod, leathery, flat, pointed, sharp tipped, narrowing near base, downy, 3 1/2-6 inches by 1/2 inch, dehiscent; seeds 6-12, 1/4 inch in diameter, oval, shining. *Home*.—Asia, tropical Africa.

Bauhinia (*Bauhinia purpurea*? Linnaeus).—A handsome, medium-sized tree is the form taken by a bauhinia that deserves wide cultivation. The leaves are cleft part way down, and they are smooth and leathery. The flowers are large and beautiful and either pure-white or orchid colored—lavender and purple, spotted with crimson. When small the trees begin to blossom and bear abundantly and continuously, sometimes for months, beginning as early as December and January. They are then a delight to the eye, looking like a huge corsage bouquet, although the leaves are ordinarily riddled by insects.—1445 Keeaumoku Street; 1420 Piikoi Street.

Leaves.—Cleft about one-third of the way down, 2-3 inches across, width greater than length, 9-11 prominent veins, stiff, smooth, heart shaped. *Flowers*.—Few in short-stemmed corymbs, each on a short stem if any. *Calyx*.—A tube 1/4-1/2 inch long, limb 1 inch long, leathery, 2-valved, 5-toothed. *Corolla*.—Twice as long as calyx, petals 5, purple, narrow for a way up from the base, broader above, lowest petal with some red and yellow; some white. *Stamens*.—Ten, 3 fertile. *Pistil*.—Style long; stigma large, oblique. *Fruit*.—Pod, hard, flat, smooth, 6-12 inches long, 1 inch wide, somewhat decurved, opening late; seeds 10-15. *Home*.—India.

Phanera (*Bauhinia corymbosa* Roxburgh).—The *phanera* is an arbor vine that is increasing in popularity in Honolulu. Its branches are hairy, taper slightly, and bear tendrils. The leaves are small. After the pale-pink flowers fall, flat pods begin to form, which when ripe are nearly half a foot long and dark purple-brown in color.—Forming arbors in several gardens.

Leaves.—Small, cleft at apex and lobed at base, 1 1/2-2 inches long, hairy beneath on veins and stems; leaflets 2, half oval, blunt, 3 prominent veins. *Flowers*.—Small, pale-pink, numerous, corymbose, 1 inch across. *Calyx*.—Hairy. *Corolla*.—Petals 5, oval, stalked, fluted. *Stamens*.—Bright-red, 3 very long, others not fully formed. *Fruit*.—Pod, flat, about 5 inches long, dark purple-brown. *Home*.—China.

Bauhinia (*Bauhinia binata* Blanco).—A few specimens of a beautiful and strange-flowered bauhinia tree have been planted in Honolulu. The flowers have oblong, whitish petals, from the bases of which and exceeding them in length extend ten conspicuous crimson stamens. The leaves are cleft to the stem into oval halves.—Grounds of University of Hawaii; grounds of Normal School on Emerson Street.

Leaves.—Compound, leathery; leaflets distinct, oval, opposite at tip of stem, each nearly 1 1/2 inches in diameter, 5-7 veined. *Flowers*.—White, crowded in axillary racemes on short stems. *Calyx*.—A cylindrical tube about 1/3 inch long, velvety; sepals lanceolate and not equalling the tube. *Corolla*.—Petals 5, oblong, narrowing near base, downy outside, especially near base. *Stamens*.—Crimson, 10, all fertile, longer than petals and conspicuous. *Fruit*.—Pod, smooth, about 5 inches by 1 inch; seeds 8-10. *Home*.—Siam, Philippines.

Kassod tree (*Cassia siamea* Lamarck). Figure 29, a.—A cassia with gray, nearly smooth bark is called the *kassod* tree. In Honolulu, where it was brought 75 years ago, it is fairly large and thrives with little moisture; in Ceylon it is described as moderate sized or small. In India and Malaysia it prefers moist regions, as near streams, and lives in lowlands and to a height of 2,000 feet. Though not so handsome as the yellow poinciana it resembles it somewhat in shape, in its long heavy crown of foliage, and in the manner of flowering, between July and October bearing lemon-yellow flowers in erect pyramidal clusters up to a foot or two long. The long narrow pods are formed in clusters in abundance and can be seen hanging from the branches from one season to the next. As they ripen they turn light-gray and become rather untidy looking. The wood is used for small articles in Ceylon.—Thomas Square; Capitol grounds.

Leaves.—Pinnate, 6-12 inches long; rachis 6-10 inches long, stout, swollen at base, nearly smooth, shallowly channeled above; leaflets 6-10 pairs or more, stalked, about 3 inches long, oblong-lanceolate, tipped with a point, smooth, thick, glaucous beneath. *Flowers*.—In pyramidal axillary and terminal panicles up to a foot long, lemon-yellow; individual flowers up to 1 1/2 inches in diameter, on pedicels an inch long. *Calyx*.—Slightly pubescent, 5 segments. *Corolla*.—Petals 5, distant, clawed. *Stamens*.—Filaments of 2 of the fertile ones twice as long as the rest. *Pistil*.—Long, curved. *Fruit*.—Pod, 6-12 inches by 1/2-3/4 inch, stalked, flat, pubescent, beaked, edges thickened, 8-20 seeds. *Home*.—India, Malaysia.

Candle bush, acapulco (*Cassia alata* Linnaeus.) Figure 29, *b*.—With its small size (it is a shrub 3 to 12 feet high) and with its yellow flowers closely packed on a spike, the short-lived candle bush does not resemble its close relatives, the shower trees. It is a popular shrub, being cultivated in all tropical countries. In Ceylon, where it is common by paddy fields and other wet lowland places, it is probably more luxuriant than in Hawaii, for it is described from there as a "handsome, stately plant." The branches are downy and green, and the smooth leaves are much subdivided. Leathery pods, straight, narrow, and winged, contain as many as 60 seeds. Parts of the shrub serve several purposes. In India the bark is used for tanning. The leaves and seeds have medicinal value, curing skin diseases (as ringworm) and poisonous bites and fever.—Corner of Vancouver Highway and Kaala Avenue.

Leaves.—Pinnate, 1-3 feet long; leaflets 2 1/2-7 inches long, ovate-oblong, broad, round tipped, largest upwards, opposite, smooth. *Flowers*.—Yellow, in terminal and axillary spikelike peduncled racemes up to 20 inches long, buds overlapping. *Calyx*.—Membranous, subequal, 5 segments. *Corolla*.—Diameter 1 1/2 inches, 5 petals. *Stamens*.—Ten, 3 upper being staminodia. *Fruit*.—Pod, straight, winged, leathery, 5-6 inches by 1/2-3/4 inch; as many as 60 seeds, small, flat. *Home*.—Tropical America (Rock); all Tropics (Kew Index).

Cassia, kalamona (*Cassia glauca* Lamarck). Figure 29, *d*.—From India to the eastern extremity of Polynesia a shrubby cassia is distributed, and though not native in Hawaii it is now growing wild in the islands. It is used ornamentally, in several parts of Honolulu serving as hedges. Its branches arch widely and gracefully, and each shrub has a distinct individuality. This cassia is lavish with clumps of orange-yellow flowers, which are borne the year round, as are also thin brown pods. The bark is used medicinally by diabetes patients. As the plant resembles a native cassia (*Cassia gaudichaudii*), called *kalamona* by Hawaiians, this introduced cassia has been given the same native name.—Manoa Park.

Leaves.—Pinnate, stems distinct; leaflets, 8 or 9 pairs, blunt, 1-2 inches long, ovate, stiff, whitish. *Flowers*.—Orange-yellow, in corymbs, sepals blunt, otherwise like other cassias. *Stamens*.—Ten, perfect. *Fruit*.—Thin, papery, smooth, brown pods, 3-4 inches long, opening on one side, on rather long stems; seeds 10-12, small, brown, shining. *Home*.—Tropical Asia, Australia, Polynesia.

Pink shower (*Cassia grandis* Linnaeus). Figure 28, *b*.—Though most of the pink showers in Honolulu are rather small trees, 12 to 30 feet high, they can grow as tall as 50 feet. They have smooth, gray bark and widespreading branches. The leaves are divided into many leaflets, which are pink when young, the new annual supply appearing just before, with, or following the flowers. But the flowers are the chief attraction that has won for the tree popularity in many tropical countries. As far back as 1888 it was cultivated in Honolulu.

At first pinkish-lavender, the buds seem veiled until they begin to open out into rich coral-pink flowers, which are massed in thick, short clusters along the branches. Early trees begin to bloom the end of March, and late ones last till the middle of May. They lay a pink carpet on the ground below, as if the color of the heavily flowering branches above were reflected there. The narrow, yard-long pods require about a year to develop their pretty ribbed seeds, which are embedded in a sticky, bitter, unpleasant-smelling pulp with laxative properties. The seeds are used in leis.—Bordering Captain Cook Avenue; bordering Liholiho Street between Wilder Avenue and Lunalilo Street.

Leaves.—About 8 inches long, alternate, deciduous, pinnate; leaflets 10-20 pairs, oblong, large, covered with brownish pubescence; young leaves pink. *Flowers*.—Coral-pink, buds pinkish-lavender, in axillary racemes shorter than the leaves. *Calyx*.—Five segments, covered with lavender pubescence. *Corolla*.—Petals 5, imbricate, subequal, or the lower larger. *Stamens*.—Ten, anthers hairy. *Fruit*.—Pod, cylindrical, 1 1/2-3 feet long, about 1 inch in diameter, ribbed; seeds many, embedded in sticky, bitter pulp. *Home*.—Central America.

Golden shower, Indian laburnum (*Cassia fistula* Linnaeus). Figure 28, *a*.—One of the most beautiful flowering trees in Honolulu is the golden shower or "Midas tree." Beginning in March, reaching their prime in June and July, and passing in August, orange-yellow bunches of flowers, resembling in shape and size huge bunches of grapes, hang from slender, somewhat drooping branches. Falling petals lay dainty and quickly perishable carpets. In Ceylon the flowers are used in temple ceremonies. Each flower is like a large



FIGURE 28.—Bean family, senna subfamily: *a*, golden shower (*Cassia fistula*), part of leaf, flowers, buds; *b*, pink shower (*Cassia grandis*), part of leaf, flowers; *c*, pink-and-white shower (*Cassia nodosa*), part of leaf, flowers.

spreading pea, and the fruiting part has an interesting development covering a year's time, during which it becomes a straight, black, smooth, cylindrical pod reaching a yard in length and an inch in diameter. These pods have caused the name, "pudding pipe tree." In each one, as many as a hundred yellow-brown seeds form, separated by dark, sticky partitions—a pulp used medicinally in Asia and responsible for another popular name, "purging cassia." The seeds are used for leis in Hawaii and India.

In parts of southern Asia the tree is common in dry forests as high as 3,000 feet. The bark, smooth and pale-gray, becoming brown and rough with age, is used for tanning and medicine in Asia. The long, compound, rather luxuriant leaves usually remain on the tree till shortly before flowering time, and sometimes new leaves come before the flowers.—Bordering Pensacola Street between Wilder Avenue and Lunalilo Street.

A story told to Chinese children during the Moon Festival, which is celebrated the fifteenth day of the eighth moon, is that of a cassia tree growing on the moon. It is more than 5,000 feet high, and it blooms all the year. Chopping away at the trunk is Wu Kang, whose task is endless, for the moment he takes his axe away the trunk becomes whole again. It is not known what species of cassia the Chinese believe this to be.

Leaves.—Large, pinnate, on smooth rhachis 6-12 inches long; leaflets, 4-8 pairs, stalked, 2-6 inches long, smooth, stiff, ovate, acute. *Flowers*.—Bright orange-yellow, hanging in long, loose, axillary racemes, about 1 foot long; single flowers about 2 inches long, on pedicels about 1 1/2 inches long. *Calyx*.—Smooth, segments obtuse and concave and with nearly equal teeth, 5. *Corolla*.—Concave, veined, spreading, 5, nearly equal petals. *Stamens*.—Ten; 3 lowest long and curved, 4 lateral short and straight, 3 upper straight and very small. *Pistil*.—Long and curved. *Fruit*.—Straight, smooth, cylindrical pod, black, up to 3 feet by 1 inch, indehiscent, on short stem; seeds as many as 100, golden-brown, flattened, circular, embedded in dark, sticky pulp with partitions between each seed. *Home*.—Tropical Asia.

Pink-and-white shower (*Cassia nodosa* Hamilton). Figure 28, c. —When laden with masses of flowers, sometime between March and September, usually in June, one of the commonest showers, the pink-and-white, makes a beautiful display. The flowering period of each tree, as well as of the species, is long, and the tree is showy from the time the first buds appear, through their prime, when they form a continuous pink and white inflorescence for a yard or so

along the branches, to the time when pink is fading to white, and the ground is carpeted with petals.

The tree is rather small, at most about 20 feet high, and has branches spreading widely in a horizontal direction. These may be quite bare of leaves before the flowers come, or may have with the flowers new leaves, which develop into thick foliage, divided into many small leaflets. Long, cylindrical pods similar to those of the pink shower contain many rounded flattened seeds, which are used in leis.—Piikoi Street, between Wilder Avenue and Lunalilo Street.

It is said that a similar cassia (*Cassia javanica*) is growing in Honolulu that has smaller, blunter leaves.

Leaves.—About 1 foot long, deciduous, pinnate; leaflets 6-12 pairs, ovate, opposite, short stalked, 2-4 inches long. *Flowers*.—Pink and white, slightly scented, in dense corymbose racemes less than 6 inches long, covering old branches for a yard or more. *Calyx*.—Five segments. *Corolla*.—Petals 5, imbricate, equal. *Stamens*.—Ten; smooth anthers. *Fruit*.—Pod, cylindrical, nodose, nearly 20 inches long; seeds tan, circular, flattened, embedded horizontally between sticky wadlike layers. *Home*.—Tropical Asia.

Rainbow shower (*Cassia fistula* x *Cassia nodosa*).—A beautiful hybrid tree can be produced from seed resulting from pollinating the blossom of a pink-and-white shower with a blossom of a golden shower. Among the seeds borne in the pod resulting from this combination are some intermediate in shape between those of their parents. The trees that develop from planting these seeds have leaves and flowers that are also intermediate in form and size. The flowers range in color from cream to orange and red, some furnishing a display that has few equals in Honolulu. The earliest begin to flower in March, reach their prime in June, and are nearly past in August. A gorgeous example with pinkish-orange flowers is growing at 1060 Lunalilo Street, one with cream-colored flowers at Kamanele Park, others at 1543 and 1555 Pensacola Street.

Cassia, lauki (*Cassia mimosoides* Linnaeus). Figure 29, c.—One of the commonest weeds in Hawaii is a small cassia, which is a partly erect shrub two to three feet high. Its finely divided leaves cause it to be mistaken for the sensitive plant. But by its bright-yellow flowers with conspicuous petals it is easily distinguishable. Many years ago, this cassia, which is now a cosmopolitan tropical weed, was introduced into Hawaii. Though growing mostly at low elevations, in India it climbs the Himalayas to an elevation of 6,000



FIGURE 29.—Bean family, senna subfamily: *a*, kassod tree (*Cassia siamea*), leaf, flowers, pod; *b*, candle bush (*Cassia alata*), leaf and flowering cluster; *c*, cassia (*Cassia mimosoides*), leaves, flower, pod; *d*, cassia (*Cassia glauca*), leaf, flowers, pods.

feet. On farm land it is a pest. But it has uses, being helpful for binding sandy soils. In Japan and Hawaii leaves and stems are used for tea, and in India the root is considered a cure for stomach trouble.—Oahu Avenue near Waoli Tea Room.

Leaves.—Pinnate; leaflets, 15-30 pairs, linear, oblong, pointed, rigidly membranous, the midrib nearer the upper margin, 1/3-2/3 inch long, smooth or almost hairy, gland below lowest pair of leaflets, sessile and depressed. *Flowers*.—Several fascicled in leaf axils, small or medium sized, on very short pedicels; sepals very acute; petals rounded. *Stamens*.—Ordinarily 10, anthers unequal in size. *Fruit*.—Pod, varying in size up to 3 by 1/7 inches, smooth, or downy. *Home*.—South America (Rock); all Tropics (Kew Index).

Cassia (*Cassia bicapsularis*). See page 308.

Cassia (*Cassia moschata*). See page 308.

Colvillea (*Colvillea racemosa* Bojer).—The colvillea promises to be an attractive tree. From seeds brought in 1918 to Honolulu a few trees are growing but have not yet had time to become fully developed and have only recently begun to flower.

The leaves are fine and similar to those of the poinciana but a little larger. The flowers are unusual in color, the buds being a rich orange-red, the blossoms orange. They grow crowded in long cylindrical clusters, a dozen or so coming out from the ends of the branches, and the basal flowers open first.

This tree is a welcome addition to the flora of Honolulu, as it blossoms in October and November for about 1½ months, extending the period of flowering trees, which formerly was practically ended by the beginning of October.—1328 Matlock Avenue; 2502 Nuuanu Avenue.

Leaves.—Bipinnate, 3 feet long, alternate, remote; pinnae opposite, 20-30 pairs, 4 inches long; leaflets 1/2 inch long, 20-28 pairs. *Flowers*.—Crowded in cylindrical clusters, 1 1/2 feet long, 12 or so from branch ends, about 200 flowers in a cluster; basal flowers opening first, buds orange-red and velvety, blossoms orange. *Calyx*.—Segments united, 4 or 5. *Corolla*.—Five, upper 1 broad, side ones smaller, basal ones narrow. *Stamens*.—Thick, long, yellow, 10. *Fruit*.—Pod, straight, swollen, 2-valved. *Home*.—South Africa.

Royal poinciana, flame tree, flamboyant, peacock flower [*Delonix regia* (Bojer) Rafinesque-Schmaltz]. Plate XXV.—One of the showiest and best-loved trees in Honolulu is the poinciana. Its scarlet flowering branches spread a dazzling parasol, which is better known than its picturesque gnarly trunk and branches. Like apple trees, many poincianas have marked individuality of appearance. The tree grows rapidly 20 to 40 feet high and has smooth and light-gray bark. The leaves have the appearance of a fine lacy fern frond,

and before flowering time, during January, February, and March, have fallen from some trees, from others being absent for a shorter period. The brilliant flowers are one of the first kinds to come out in Honolulu and can be seen for about nine months, a few appearing in January, and some late ones in September. They are particularly magnificent in June and July, when some streets are ablaze with red, both in the trees and on the ground below, where a red carpet of petals is laid. Each flower is large, and comparison of light and dark shades from different trees shows that crimson ones have a white spot on one petal and that the lighter ones, which are scarlet, have a yellow spot. In Africa the leaves and pods are larger than in Hawaii. The pods persist through the year and are attractive when green, but not when changing to yellow to brown to black from December to February. They suggest huge lima beans and contain dark, oblong seeds, which are used in leis.—Bordering Lusitana Street, Wilder Avenue, and part of Kamehameha Avenue; Capitol grounds.

Leaves.—Bipinnate, 8-15 inches long (to 24 inches in Madagascar), 8-20 pairs of pinnae; leaflets ovate, each about 1/4 inch long, downy, blunt, short stemmed. *Flowers*.—Crimson and white or scarlet and yellow, in terminal racemes, each flower 3-4 inches across. *Calyx*.—About half as long as corolla, 5 subequal segments. *Corolla*.—Petals 5, each 2 inches long, tip round, base narrow, upper petal more cuneate and with a light spot. *Stamens*.—Free, 10, filaments hairy at base, anthers oblong. *Pistil*.—Long and slender. *Fruit*.—Pod, 5-15 by as much as 1 1/2 inches (in Madagascar and Mexico 2 feet long), flat, leathery, slightly curved; seeds many, oblong, black with gray edges. *Home*.—Madagascar.

Logwood, bloodwood tree, Campeachy wood (*Haematoxylon campechianum* Linnaeus).—The logwood grows to a height of 30 feet or more and has large, straight branches extending from a rather irregular trunk. Its leaves are compound, being composed of three or four pairs of small blunt leaflets. From the small, yellow, fragrant flowers, crowded in clusters at the base of leaves, develop thin flat pods pointed at both ends. The heartwood is used for dyeing chiefly, also as an astringent and antiseptic and for cabinet making. Though the sapwood is white, the heartwood is red to yellow, turning dark-red in the air. The tree comes from tropical America and derives its name from Campeachy Bay, Mexico. It is growing in many tropical countries and is represented a little in Honolulu, one of the few trees growing at Kamamalu Park, corner of School and Fort streets.



A



B

PLATE XXIV. *A*, FALSE KAMANI (*TERMINALIA CATAPPA*), HOOP PINE
AT LEFT; *B*, ALGAROBAS (*PROSOPIS JULIFLORA*),
PHOTOGRAPH BY R. J. BAKER.



PLATE XXV. POINCIANA (DELOXIA REGIA), PANDANUS AT LEFT, ROYAL PALMS AT RIGHT,
PHOTOGRAPH BY A. R. WADSWORTH.

Pride of Barbados, dwarf poinciana [*Caesalpinia pulcherrima* (Linnaeus) Swartz]. Figure 30, *a*.—A bush or small tree between 9 and 15 feet high that possibly originated in tropical America, though Asia has also been suggested, is the pride of Barbados. It is self sown in Honolulu and has long been established in many tropical countries, being popular because of its beauty. In India it is sacred to a god. In Ceylon it is called the "peacock flower" and is common in native gardens but not outside. For hedges this shrub is much used, and there its stems, topped with rounded crowns of leaves and much of the time with clusters of gay flowers, bend gracefully. The flower yields honey and is not unlike that of a poinciana in shape, though its stamens are much more conspicuous. The petals of one color variety are red, and the wavy margins are edged with yellow, of another color variety all yellow. They are very common in June and fairly so in December. Most of the shrubs have smooth stems and branches, some have thorny ones. The finely divided leaves are used as a means of catching fish, which they stupefy, in Guatemala being thrown into the water for this purpose. In Mexico the green seeds are sometimes cooked and eaten, and when ripe tannin can be extracted from them, as well as a dye, which is yellow with alum, black with iron. The wood, soft and orange colored, in India is charred and used for ink.—Punahou Park.

Several other caesalpinias are cultivated in Honolulu but are less common than the pride of Barbados.

Leaves.—Up to a foot long, bipinnate; 4-9 pairs of pinnae, with or without prickles; 10-12 pairs of leaflets, 1/2-1 by 1/3 inch, blunt, thin, evergreen, pale beneath. *Flowers*.—In broad terminal and upper axillary racemes on pedicels 2-3 inches long. *Calyx*.—Smooth, overlapping lobes, 1/3 inch long, 5. *Corolla*.—Petals 5, round, wavy, narrow at base, 1/3-1 inch long, yellow or red with yellow margins. *Stamens*.—Red, 10, extending far beyond the corolla. *Pistil*.—Style red and long exserted. *Fruit*.—Pod, smooth, flat, leathery, long stemmed, fine-pointed tip, 2-4 1/2 by 3/4 inch; seeds 4-8, oval to square, flat. *Home*.—Unknown (Rock); all Tropics (Kew Index).

Kakalaioa (*Caesalpinia crista*). See page 308.

Yellow poinciana [*Peltophorum inerme* (Roxburgh) Naves, or *P. ferrugineum* Benthams]. Figure 30, *b*.—The so-called "yellow poinciana" was at one time classified with the royal poinciana—hence its name—at another time with the pride of Barbados. It is a beautiful, stately, heavy-foliaged tree and grows to a height of 50 feet or more—rather high for its shallow root system. It is

highly ornamental and grows well in dry soil, which is an advantage in Honolulu. In some parts of Asia, as Ceylon, it grows to great size. The bark is smooth and gray, downy on the young branches. From May to September, rising above the leaves, which



FIGURE 30.—Bean family, senna subfamily: *a*, pride of Barbados (*Caesalpinia pulcherrima*), part of leaf, flowers, buds; *b*, yellow poinciana (*Peltaphorum ferrugineum*), flowers and young pods.

are finely divided and large, appear in large erect clusters numerous round, rust-colored buds, which develop into orange-yellow flowers. In their neighborhood, the delicious, heady, grapelike odor that they generously exhale is quite evident. The same tree sometimes blooms twice a year. The flowers are so abundant that when falling fastest on the Capitol grounds, in June and July, caretakers gather them up in wheelbarrows. The pods, which are flat and thin,

are a rich dark red when ripe and in summer and fall are an attractive feature of the tree. Later they turn black and though empty continue till the next flowering season to cling to the tree.—1234 Beretania Street; King Street side of Capitol grounds; Pacific Club, Emma Street.

Leaves.—Bipinnate, rachis up to $1\frac{1}{2}$ feet long, 8-10 pairs of pinnae; leaflets 10-20 pairs, sessile, $\frac{1}{2}$ - $\frac{3}{4}$ inch long, oblong, smooth above, rusty-pubescent on midrib beneath, notched. *Flowers*.—In large erect panicles of many short-stemmed orange-yellow flowers, 1 inch or so in diameter. *Calyx*.—Round in bud, covered with rust-colored hairs, up to $\frac{2}{5}$ inch long, 5 sepals. *Corolla*.—Petals 5, round, orange-yellow, hairy at base, longer than calyx. *Stamens*.—Filaments hairy at base, 10, anthers uniform. *Pistil*.—Large peltate stigma. *Fruit*.—Flat, thin, winged, indehiscent, margin narrowly winged, red turning blackish, up to 4 inches long, nearly 1 inch wide, 1-4 seeded. *Home*.—Malaysia, Australia, neighboring islands.

PEA SUBFAMILY

(Papilionatae)

Rattle-box (*Crotalaria sericea* Retzius).—Nine kinds of rattle-boxes are growing in Hawaii, and most may be found wild. One kind especially (*Crotalaria sericea*), which was introduced many decades ago, thrives as a weed. It has a use as a green manuring crop. In India it is cultivated in gardens for the flower or is grown for the fiber it yields. Some of these shrubby plants grow as high as four or more feet. On nearly smooth branches are borne oblong, short-stemmed leaves and loose clusters of 20 or more yellow, sweet-pea shaped flowers. The pod, an inch or two long, approaches the cylindrical and contains several seeds that rattle when the pod is shaken.—Along country roads.

Leaves.—Simple, broadly spatula shaped or oblong, tipped with a sharp point, wedge shaped at the base, smooth above, silky beneath, 2-6 by $1\frac{1}{2}$ inches; petiole $\frac{1}{5}$ inch long; stipules persistent, leaf-like. *Flowers*.—In loose terminal or axillary clusters, 12-20 inches long, 20-40 flowered; individual flower stems $\frac{1}{2}$ inch long; bracts large, ovate, leaf-like, persistent. *Calyx*.—Tube bell shaped, 2-lipped, with lanceolate lobes, $\frac{1}{2}$ inch long. *Corolla*.—Yellow and purple, 1 inch long, much exserted, superior lobes ovate, inferior lobes ovate-lanceolate. *Stamens*.—Grouped in 2 bundles. *Pistil*.—Ovary stalked; pistil bearded. *Fruit*.—Pod 1-2 inches long, smooth, oblong, inflated, stalked; seeds several. *Home*.—India (Rock); East Indies (Kew Index).

Rattle-box (*Crotalaria fulva* Roxburgh).—A common rattle-box in Hawaii differs from *Crotalaria sericea* in having branching flower

clusters, branches clothed with brown silky hair, and calyx silky. The pod also is silky, is only half an inch long, and contains but two seeds. The presence of this rather stiff shrub in Hawaii was first recorded about 40 years ago, beside the road in Nuuanu Valley. It is now found wild on roadsides. In tropical Asia it is at home.

Indigo, inikoa (*Indigofera anil* Linnaeus). Figure 31, *b*.—To many countries indigo has been introduced, and about 1850 it was brought to Hawaii for raising commercially. Though this plan was soon given up, the plant did not disappear, but increased, until it is now found abundantly on roadsides and in other waste places at low elevations. Several species of indigo are known in both hemispheres, and some have long served mankind, their usefulness being known to the Egyptians. In southern United States a kind was raised commercially for several years preceding the Revolution, when cotton began to take its place. In Mexico, Brazil, and India, much is being grown today, but less than formerly, as competition with the synthetic material is proving too strong.

The commercial product, a deep-blue earthy substance used as a dye, is obtained by allowing plants to ferment in water for 12 to 16 hours, after which the liquid is run off and then agitated for two or three hours. Later, indigo settles as bluish mud. The plant refuse is a good fertilizer, being rich in nitrogen. About 20,000 pounds of plants are produced on an acre, from which about 500 pounds of indigo paste may be separated.

The plant grows three feet high or more, has several branches, and is woody only at the base. Among the leaves, which are subdivided into several leaflets, minute reddish flowers can be found, but not often in such numbers as the tiny crowded tenacious pods, which curve strongly upwards.—Oahu Avenue, near Waioli Tea Room.

Leaves.—Pinnate, 2-3 inches long; leaflets 5-17, opposite, oblong to elliptical, apiculate, 1/2-1 inch long, pale or hoary and appressed downy beneath. *Flowers*.—In axillary, dense, solitary racemes, 3/4 inch long or more, on short pedicels, reddish, individuals barely 1/5 inch long. *Calyx*.—Small, oblique, bell shaped, with short, broad teeth, which are subequal or lower longer than others. *Corolla*.—Long exserted, standard obovate or nearly round, wings oblong. *Stamens*.—Ten, upper 1 free, others united. *Pistil*.—With short style. *Fruit*.—Many reflexed, strongly curved pods about 1/2 inch long, crowded, slightly downy; seeds 6-10. *Home*.—South America.

Gliricidia [*Gliricidia sepium* (Jacquin) Steudel]. Figure 31, *e*.—It is surprising to find so few of the dainty-flowered gliricidia in Honolulu. In Mexico, where it is used for hedges and is a favorite shade tree for cacao and coffee plantations, being planted between the trees, it is called *madre de cacao*. It is not very tall, somewhere between 15 and 30 feet, has grayish bark, and while it is evergreen in Honolulu, in the Philippines it is bare during spring. As leaves and other parts of the plant are poisonous to rats and other rodents, they are used for getting rid of such pests in tropical America, seeds, powdered bark, and leaves being mixed with rice for that purpose. The little, light-pink flowers are rather abundant and sometimes appear for short periods in January, February, and March. In the Philippines they are said to be much more abundant, covering the tree with pink in the spring. Long after flowering time, the flat pods open, and each scatters its half dozen or so of seeds.—North side of road near top of Manoa hill.

Leaves.—Pinnate, opposite, 6-10 inches long; leaflets about 13, paired, with extra one at tip, oblong, pointed, base rounded, about 2 inches long, light beneath, shining on top, most blotched with bronze. *Flowers*.—Many dense racemes an inch long or more, on leafless or nearly leafless branches in axils of fallen leaves, each flower $\frac{3}{4}$ inch long, light-pink with yellow spot in middle of upper petal, which is bent back. *Fruit*.—Pod, flat, 4 inches long or more by $\frac{3}{4}$ inch wide; seeds 6-8. *Home*.—Mexico (Rock); tropical regions (Kew Index).

Sesban, ohai keokeo [*Sesbania grandiflora* (Linnaeus) Persoon]. Figure 31, *d*.—From tropical Asia the sesban seems to have been introduced in early days to Hawaii. But as it is short-lived and care has not been taken to continue its existence the tree has become rare. It is not tall, 30 feet being considered high. The branches are straight and slender, the bark thick and cracked—hence the Australian name of “corkwood tree.” The leaves are subdivided, narrow, and about a foot long. The flowers, large, white, and sweet-pea shaped, grow in twos, threes, or fours and are borne for a long period once or twice a year. Most striking of all, perhaps, are the vertically hanging, long, narrow pods. They have a maximum length of two feet and a diameter of only half an inch, and many slight swellings mark the position of the seeds.

The tree has several uses. Charcoal for gunpowder is made from the light, soft wood. The leaves, flowers, and pods are edible, in India all being used as a vegetable, flowers and green pods as



FIGURE 31.—Bean family, pea subfamily: *a*, butterfly pea (*Clitoria ternatea*), leaf and flower; *b*, indigo (*Indigofera anil*), leaf and pods; *c*, fish poison tree (*Piscidia erythrina*), leaf and pod; *d*, white sesbania (*Sesbania grandiflora*), part of leaf, flowers; *e*, gliricidia (*Gliricidia sepium*), leaf, flowers, young pod.

salad or pot herb. The leaves are also used medicinally, while leaves and young shoots afford fodder for cattle. The bark supplies a bitter-tasting medicine, said to be a remedy for fever.—2011 Hunnewell Street.

Leaves.—Narrow, 7-12 inches long, pinnate; leaflets, 20-30 pairs, smooth, about an inch long. *Flowers*.—In few-flowered axillary, pendulous racemes. *Calyx*.—Green, nearly 1 inch deep, smooth, some 2-lipped. *Corolla*.—Resembling that of a sweet pea, petals white and 3 inches long. *Fruit*.—Pod, curved, hanging, 8-24 inches long, nearly $\frac{1}{3}$ inch wide, swollen where seeds lie; seeds 30-50. *Home*.—India, Malaysia, Australia.

Sesban [*Sesbania grandiflora* (Linnaeus) Persoon var. *coccinea* Poiret].—A variety of the sesban has red flowers, which have been seen blooming at the end of April, in June, and in December. A few trees are growing on Palolo Avenue near Waialae Avenue and on the grounds of the University of Hawaii. Like the white-flowered sesban, this variety has become rare.

Egyptian rattlepod [*Sesbania sesban* (Linnaeus) Merrill].—A shrubby, woody species of sesban is about six feet high. It bears pods about eight inches long and one-twelfth of an inch wide, which are twisted when open, and has small yellow flowers marked with purple. It is found in all tropical parts of Asia, Africa, and Australia. In Honolulu it is rare; but some plants are said to be growing up Kalihi Valley and also in vacant lots on King Street near the Bishop Museum.

Pongamia [*Pongamia pinnata* (Linnaeus) Merrill].—The pongamia is found in India, Ceylon, northern Australia, and Polynesia. It seems to like the ocean, for it is found near it and near streams feeling the effect of the tide. In Honolulu it is rare, but is conspicuous during flowering time, which sometimes comes in January. It grows rather rapidly 25 to 75 feet tall and is good for avenues. Its smooth bark exudes a black gum. The compound leaves, hanging from smooth, drooping branches, make good fodder, and by virtue of an antiseptic quality they possess they destroy blight. The delicate, lavender or pinkish flowers resemble the wistaria and hang in clusters that spread fragrance in the surrounding air. The short, woody, pointed pod ordinarily contains a single seed, from which in India an oil is extracted that is used medicinally and for lights.—Grounds of University of Hawaii.

Leaves.—Pinnate, 8-10 inches long, stem 4 inches long, smooth; leaflets 2-6 inches long, as wide as 3 inches, the end one longest, opposite, 5-9, ovate or oblong, rounded or pointed at tip, stemmed. *Flowers*.—Many, in dainty axillary racemes 6-8 inches long, on stems 2-3 inches long, lavender or pink, fragrant, each flower $\frac{1}{2}$ inch long. *Calyx*.—Bell shaped, 5-parted. *Corolla*.—Petals 5, clawed, wide at tip, upper petal round, side petals and keel oblong and downy, standard broad. *Stamens*.—Upper filament free nearly to base, others united. *Pistil*.—Incurved. *Fruit*.—Pod, smooth, woody, $1\frac{1}{2}$ by 1 by $\frac{1}{4}$ inch, flattened, point short and curved, indehiscent, 1-seeded or rarely 2; seeds $\frac{3}{4}$ inch in diameter. *Home*.—Tropical Asia and Australia.

Fish poison tree (*Piscidia erythrina* Linnaeus). Figure 31, c.—A medium-sized slow-growing tree is the fish poison tree—so called as in the West Indies the bark is used for drugging fish. After being thrown into the water, its hypnotic effect brings fish from their hiding places and deadens them so that they are easily caught. It is also used medicinally. The small, dainty, white or lavender flowers grow in thick clusters on the tree, which is a charming sight when in full bloom. Shortly after the flowers pass, pods form, and they are the most striking feature of the tree, hanging in great numbers clustered all over it. They are margined with wide wings, and their light-green color contrasts with the dark-green of the leaves.—Thomas Square.

Leaves.—Bipinnate, pinnae alternate, several; leaflets opposite, 6-10 with extra one at tip, slightly downy, dark-green, oblong or elliptical, pointed or blunt. *Flowers*.—White to purple, in lateral racemes, each flower about $\frac{1}{2}$ inch across. *Calyx*.—Somewhat bell shaped, 5 short and broad teeth. *Corolla*.—Petals 5, top round, side ones sickle shaped with wavy or lobed edges, 2 lower forming a keel. *Stamens*.—Upper 1 free, at middle united with others in a tube. *Fruit*.—Pod, 2-4 inches long, $\frac{1}{3}$ inch wide, papery, flat, bearing on each of the 2 margins 2 wide wings; seeds 6-8, oblong, black, somewhat flattened, $\frac{1}{4}$ inch long. *Home*.—Tropical America.

Black-eyed Susan, bead vine, weather plant, crab's-eye vine (*Abrus precatorius* Linnaeus).—A smooth, slender, branching vine that grows as long as 25 feet, black-eyed Susan, is best known for its seeds, which are used in leis. They are scarlet with a black patch, oval, and shining. Rarely is a white one or an entirely black one found. As they are uniform in size, being a quarter of an inch in diameter, and have a uniform weight, they are used by jewelers in some countries as weights. They have also been used as food, but only when cooked, for otherwise they are said to be poisonous. Buddhists employ them for rosaries. The leaves are small and subdivided, and their softness explains part of the scientific name, *abros*

meaning "soft." They have a licorice taste, and in India are dried and used for tea. The roots have the medicinal properties of licorice. At one time it was believed that the plant prophesied the weather. The flowers grow in bundles and are pink or lavender, rarely white. This vine's home probably is Asia, but for long it has been found in most tropical countries. In Honolulu it is not commonly cultivated. In China it is called "anxious desire," because a woman whose husband had died wept in its shade and died of grief.—Cultivated in a few places.

Leaves.—Spreading, pinnate, channeled; leaflets, 7-12 pairs with odd leaf at the end, oblong, opposite, thin, smooth or silky beneath, about $\frac{1}{2}$ inch long, bright-green, obtuse. *Flowers*.—Several in terminal or axillary racemes, on thick joints, 1-3 inches long, pink to lavender, single flowers $\frac{1}{2}$ inch long. *Calyx*.—Bell shaped, with short teeth, slightly silky or not silky. *Corolla*.—Upper petal oval, keel petals joined from base and longer than narrow side petals, $\frac{3}{8}$ inch deep. *Stamens*.—United below, split above, 9-10. *Fruit*.—Pod, flat, silky when young, smooth when mature, unstalked, beak sharply bent, about $1\frac{1}{4}$ by $\frac{1}{2}$ inch; seeds 3-6, oval, $\frac{1}{4}$ inch in diameter, shining, scarlet with a black patch, rarely wholly white or black. *Home*.—Tropics.

Clitoria, butterfly pea (*Clitoria ternatea* Linnaeus). Figure 31, a.—The vivid-blue flowers extending their wavy-rimmed cups here and there from trellises and other supports in gardens belong to the popular vine clitoria. Its home, like that of many other plants, is not known, for it has long been cultivated in the Tropics and in many countries naturalized. The specific name *ternatea* refers to the island of Ternate, in the Moluccas. In India, girls are named after this flower, which is there known as *aparā-zitā*, meaning "invincible." It is sacred to Durga, the wife of Siva. Large, flat pods are formed abundantly amongst the compound leaves. Vines bearing double flowers are not uncommon.—Fernhurst (single flowers).

Leaves.—Numerous, unequally pinnate, short stemmed; leaflets, 5-7, paired, with 1 at the end, elliptical or oblong, obtuse, $\frac{3}{4}$ - $2\frac{3}{4}$ inches long. *Flowers*.—Showy, solitary, 1 inch long or more, axillary, on a jointed, short, drooping stem; ordinarily rich-blue, some white; ordinarily single, some double. *Calyx*.—Green, $\frac{3}{4}$ inch long, tube longer than the 5 lobes, which are thin, oval, pointed. *Corolla*.—Five petals, upper one narrow at base, much larger than others, bifid, somewhat reflexed, deep-blue, most with white center, $1\frac{3}{4}$ by $1\frac{1}{3}$ inches; side ones widening from base; keel sac shaped. *Stamens*.—In 2 bundles, 10. *Pistil*.—Style flattened, bearded along upper side. *Fruit*.—Pod, 4-5 by $2\frac{3}{4}$ inches, flat, nearly straight, sharp beaked, with a few hairs, prolific, 5-12 seeded; seeds rounded, flat, about $\frac{1}{4}$ inch in diameter, greenish mottled with brown. *Home*.—All tropical regions.

Erythrina (*Erythrina abyssinica* Lamarck). Figure 32, *a*.—An African erythrina is a unique and attractive tree not much exceeding 20 feet in height. The bark on the trunk is furrowed deeply and coarsely longitudinally and almost to the tips of the wide-spreading branches, and it bears many stout thorns. In a general way, the leaves resemble those of the tiger's claw, though the three leaflets are rounded, leathery, and matted with hairs. The flowers look like scarlet flaming torches, crowded together as they are in masses on oval spikes. But they burn from the bottom up, that is, the lowest flowers blossom first, and they pass slowly. One year they lasted on one tree from the first of May to the middle of August. The woody pod is similar to that of the tiger's claw, not so long, more deeply constricted, and the seeds scarlet. Trees of this kind growing at the University ordinarily flower in January and February, while two on Kinau Street flower in April and May.—Grounds of University of Hawaii; 1415 Kinau Street.

Leaves.—Compound; leaflets 3, rounded, leathery, matted with hairs, top-most largest—4-6 inches in diameter. *Flowers*.—Crowded in an oval spike 2-4 inches long, on stalks up to nearly 8 inches long, scarlet. *Calyx*.—An inch long, on the back matted with hairs, slit below nearly to base, above cut more than a third of way down into 5 whiplike parts. *Corolla*.—Petals 5, upper as long as calyx, side ones nearly as long, keel shorter. *Fruit*.—Pod, 4-5 inches long, woody, made up of a series of 6 swellings, each containing a small scarlet seed. *Home*.—Tropical Africa and Cape Colony (Rock); Abyssinia (Kew Index).

Tiger's claw, Indian coral tree (*Erythrina indica* Lamarck). Figure 32, *c*.—A medium to large-sized lowland erythrina, distributed from India to southern Polynesia, has been introduced into many tropical countries, including a few in Hawaii. It grows fairly fast and higher than 45 feet. The branches are thick and are provided with short, black thorns. The bark, gray, smooth, and thin, bears distinct leaf scars. In the large triply divided leaves a resemblance is seen to a tiger's claw; hence the name. When they fall, as they do in January and February in flowering time, scarlet clusters of bloom up to a foot long spread horizontally from the ends of the branches. Their abundance on the bare tree causes it to look like a gigantic piece of coral, resulting in one of the popular names, "coral tree." The pods are black and contain dark-red seeds. This tree is said to have sprung up from the churning of the ocean, also to have grown in Indra's Paradise, been stolen by Krishna, but



FIGURE 32.—Bean family, pea subfamily: *a*, erythrina (*Erythrina abyssinica*), leaf, flowering head, part of old pods; *b*, erythrina (*Erythrina cristagalli*), leaf and flower; *c*, tiger's claw (*Erythrina indica*), leaf and flowering head; *d*, cow pea (*Phaseolus semierectus*), leaf, flower, pods.

returned after his death.—Near corner of Punchbowl and Bere-tania streets; grounds of Central Grammar School.

Leaves.—Compound deciduous; leaflets 3, triangular, up to 6 inches long, smooth or nearly so, 2 lower ones close together and opposite, upper one more distant; stem 4-6 inches long. *Flowers*.—Scarlet, in racemes 6-12 inches long, crowded on woody stalks, 2-4 of which spread horizontally from branch ends. *Calyx*.—Nearly smooth, 1 inch long, at first tubular, divided into irregularly pointed segments, split along back to base. *Corolla*.—Petals 5, upper one 2 inches long; side and keel petals nearly equal, about an inch long. *Stamens*.—Nearly 3 inches long, projecting, joined together half way up. *Fruit*.—Pod black, 4-8 inches long, made up of a series of swellings, containing 6-8 dark-red, kidney-shaped seeds about 1/2 inch long. *Home*.—Tropical Asia, Australia.

Wiliwili (*Erythrina monosperma* Gaudichaud).—A native Hawaiian *wiliwili* is common from near sea level to 2,000 feet elevation on the lee side of all the large islands. It prefers dry regions: the hot coral plains of Ewa and the dry lava flows of Kona and Kau—places where many plants cannot exist.

It is a wide-spreading somewhat spiny tree 18 to 30 feet high. Many trees have short trunks with a diameter of four feet or more. The bark is yellow, thin, furrowed longitudinally; the branches are gnarled and stiff and have yellowish hairy tips. Three leaflets make up a leaf, as in the Indian erythrina, and ordinarily the leaves fall late in the season, a new supply appearing in the spring after the flowers open. Flowers develop in clusters, and they range from pale-red to white, with orange, yellow, and pale-green as intermediate colors. After they fall, a leathery, hairy pod forms, ordinarily containing two seeds, a few containing one, as the scientific name implies. The seeds are oblong and red and are used somewhat for leis. The wood is said to be the lightest of Hawaiian woods and was formerly used for surf boards, for the outriggers of canoes, and for net floats.—Near Koko Head; Round Top, beside road leading to Tantalus.

Hawaiian legend tells of four sisters of Paula. One was bald, one had wind-tossed hair, one was humpbacked; but Moholani was beautiful. Moholani married and her child was brought up by the gods. Now Moholani's husband often talked with the sirens, and at last he went down into the sea with them. Moholani besought her sisters to help her find her husband; but they shrugged and said, "That big worthless man!" Then her son came from heaven and with his lightning wrath cut the sirens into pieces. The sisters were transformed into *wiliwili* trees, the bald sister becoming

a *wiliwili* with few leaves, the sister with wind-tossed hair a tree whose leaves flutter in the breeze, the humpbacked sister a gnarly *wiliwili*. And the husband of Moholani strayed from his wife no more, for he feared the anger of his son.

Legend says that Kapunohu's strength was so great that he hurled his spear through 800 *wiliwili* trees at a single thrust.

"When flowers the *wiliwili*, then bites the shark; when flowers the young woman, then bites the law," is a Hawaiian proverb.

Leaves.—Compound, stem long; leaflets 3, ovate to triangular, 2 by 2 1/2 to 3 1/2 inches, leathery, hairy beneath, largest leaflet at end beyond the closely paired side leaflets. *Flowers*.—In racemes 3-8 inches long in axils of end leaves, covered with yellow, matted hairs, 1-3 flowers rising from knobs, pale-red, orange, yellow, white, or pale-green. *Calyx*.—About 1/2 inch long, 5-toothed, matted with hairs, at first enclosing the other parts of the flower. *Corolla*.—Petals 5, upper one 1-2 inches long, side ones oblong and short, two keel petals free and still shorter. *Stamens*.—Ten, upper 1 as long as largest petal, others shorter, anthers pointed. *Fruit*.—Pod, hairy, leathery, pointed at each end, 1 1/2-3 inches long, swollen where seeds lie; seeds 1 or 2, shining, red with narrow black and white scar, 1/2 inch long. *Home*.—Hawaii.

Erythrina (*Erythrina fusca* Loureiro).—Distributed from India to Polynesia is an erythrina not common in Honolulu. Perhaps its scarcity is due to its preference for dampness, such as the bank of a pool—an unusual taste in this group of dry-land lovers. It reaches a height of 30 feet and is peculiar for cone-shaped bumps on the trunk. While only a few small thorns persist on the branches of well-developed trees, young trees have many thick, black thorns. The leaves are longer and larger than those of the common coral tree. The stems are about the same length, and some are thorny. The dull purplish-red flowers form in showy clusters, and nearly a dozen seeds may occupy the somewhat cylindrical pod.—Davenport hotel, Pensacola Street.

Leaves.—About 10 inches long, compound; leaflets 3, twice as long as broad, leathery, smooth, terminal one ovate and 3-6 inches long, side ones ovate or elliptical and smaller; stems about 4 inches long, some with small thorns. *Flowers*.—In rather loose racemes 3 to nearly 8 inches long with 18-20 flowers, dull purple-red. *Calyx*.—Bell shaped, 2-lipped, not splitting to base, or truncate and hardly toothed, about 1/2 inch long and wide. *Corolla*.—Finely downy, 5 petals; upper petal wedge shaped, 1 1/2 inches long; side petals half as long; keel little longer. *Fruit*.—Pod, about 7 inches by 3/5 inch, nearly cylindrical; seeds 6-11, about 1/4 inch long, bean shaped, brown or spotted. *Home*.—Cochin China.

Erythrina (*Erythrina fusca* Loureiro var. *inermis* Rock).—For awhile on Anapuni Street could be seen an interesting variety of an erythrina with brownish-orange flowers and smooth stems. From the seeds of this tree some young trees are said to be growing on the grounds of the University of Hawaii.

Erythrina, common coral tree (*Erythrina cristagalli* Linnaeus). Figure 32, *b*.—An erythrina from tropical America, a shrubby tree, is rare in Honolulu. It grows as high as 30 feet or more and bears rich dark-red flowers near the ends of the branches. They resemble a cock's comb in appearance, hence *cristagalli* in the name. The three leaflets composing the leaves are twice as long as wide and grow on long stems, some of which are thorny. Several brownish-gray seeds are formed in the swollen, slightly curved pod.—Grounds of University of Hawaii.

Leaves.—Compound; leaflets 3, 2-4 by 1-2 inches, ovate to ovate pointed, rather stiff, entire; stems 3-6 inches long, somewhat thorny. *Flowers*.—In twos and fours in upper axils, brilliant-crimson. *Calyx*.—Broadly bell shaped or slightly 2-lipped, the lower lobe ending in a short point, 1/3 inch long or more. *Corolla*.—Petals 5; upper one more than an inch long and curved back, broadly ovate, narrowing at base; side ones oblong, about 1/4 inch long; keel pointed and hook shaped, 1 inch long, narrow at base. *Fruit*.—Pod, 6 inches long or more, about 1/2 inch wide, smooth, slightly sickle shaped, swollen; seeds several, oblong, brownish-gray. *Home*.—Brazil.

Sea bean, cow-itch plant (*Mucuna urens* DeCandolle).—On beaches at Waikiki and other parts of Oahu, nearly spherical seeds about an inch in diameter can sometimes be found. They are brown or marked with black lines, and a band extends around more than three-fourths of their circumference. The plants from which they come are vines growing wild on mountain slopes and in valleys. Thence the seeds are washed to the ocean and then carried by tides and winds to other parts of the island. The name "cow-itch plant" is apparently derived from the stinging hairs on pods and young shoots. When these pierce the flesh they cause itching.

Leaves.—Three leaflets, 2 1/2-5 by 1/2-3 inches, ovate, lateral ones oblique, pointed, with dense, soft hairs beneath, short stemmed; leaf stems about an inch long. *Flowers*.—Showy, yellow and red, 2 inches long, 10-15 on a peduncle. *Calyx*.—Bell shaped, unequally 4-cleft, the lowest lobe as long as the tube, silky, 1 inch long. *Corolla*.—Standard reflexed, ovate-lanceolate, 2/3 as long as wings; keel as long as wings or longer. *Stamens*.—Upper stamen free.

Pistil.—Style slender, stigma small. *Fruit*.—Pod thick, sessile, oblong, flat, covered with stinging hairs, leathery, 2-valved, with many transverse lamellae, ordinarily 1-seeded; seeds round or almost square, nearly 1 inch in diameter, flattened slightly, brown or marked with black lines, hard, raphe extending over $\frac{3}{4}$ of circumference. *Home*.—Tropical America (Hillebrand); South America (Kew Index).

Sea bean, kaeae (*Mucuna gigantea* DeCandolle).—A sea bean known as *kaeae*, found on the beaches, differs from the cow-itch plant in having rather flat seeds, smooth pods, and green flowers. It comes from Malaysia and the East Indies.

Sea bean, dioclea, maunaloa (*Dioclea violacea* Von Martius).—A Brazilian sea bean similar to the cow-itch plant and *kaeae* grows in valleys here and there on Oahu. After being carried down to the ocean its seeds are washed up on the beaches. These can be distinguished from those of the *kaeae* by the band on the circumference, which is shorter. Formerly the beans were used by the Hawaiians for medicine. From its flowers, which are blue or white, one of the most beautiful kinds of leis in Hawaii is made.

Pigeon pea, Congo pea, Porto Rican pea (*Cajanus indicus* Sprengel).—According to the botanist, Hillebrand, the pigeon pea was brought in early days to Hawaii. Not until about 1908 was it grown extensively as feed for horses, cows, and poultry. The green crop is used for pasturage, and the hay and seeds are ground up for meal. The plants also serve as windbreaks to protect the young of other crops. During the war seeds were scattered in waste places in Hawaii; but the crops were little used. In northern India the nutritious seeds are an important food supply and are eaten green or ripe, in India being made also into a sauce called "dal," which is eaten with curry. The pigeon pea grows up to an elevation of 6,000 feet in the Himalayas, and in Hawaii it prospers in dry land under conditions not favorable for most similar crops. It is fortunate in suffering little from insect pests. It is a slender, hairy shrub with many branches, three to ten feet high. At the end of its life of three or four years, the remains of the plant are plowed under, when its roots with many clusters of nodules containing nitrogen enrich the soil. The plant has other uses. In the Orient it furnishes food for silk worms, and in Central Africa the stems when struck or rubbed with reeds are said

to produce fire. The foliage of most varieties, of which there are two principal ones in Hawaii, is rather luxuriant. The crop of seeds is large, and pods are borne sometime during the first year. On suitable soil in Egypt, 4,000 pounds of peas are raised to an acre.—Field at University of Hawaii.

Leaves.—Pinnate; leaflets 3, elliptical to oblong to lanceolate, 1-4 inches long, acute, dotted with resinous specks, grayish, stems $\frac{1}{2}$ inch. *Flowers*.—Yellow or red and yellow, blooming all the year, axillary, mostly twinned on a short cluster, $\frac{1}{2}$ inch long or more, bracts deciduous. *Calyx*.—Bell shaped, lobes awl shaped, recurved, 4, upper 2-toothed. *Corolla*.—Standard recurved, nearly round, auricles inflexed at base, with 2 callosities above claw, some veined with purple; wings and keel nearly the same length; keel straight, blunt. *Stamens*.—Upper 1 free from base. *Pistil*.—Ovary subsessile, several ovules; style slender below, thick above middle; stigma oblique, rounded. *Fruit*.—Pod 2-3 inches long, straight, point incurved, flat, more or less hairy and glandular, with oblique, indented lines between the seeds, shape variable, most in upper third of plant; seeds 3-6, gray and mottled or red, somewhat flattened, with oblong raphe. *Home*.—East Indies (Kew Index); India or tropical Africa (Krauss).

Cow pea (*Phaseolus semierectus* Linnaeus). Figure 32, d.—A common weed on roadsides and lawns in Honolulu and in most other tropical regions is the cow pea, so called because it is a favorite food of cattle and very nourishing. From roots bearing nodules rise stems, somewhat branched, woody at the base, most less than a yard high. They are smooth or hairy, erect or, rarely, twining. At the base of the leaves, which are divided into threes, purplish-red pea-shaped flowers appear, later long, narrow pods, which form spirals after opening and scattering many tiny seeds.—Roadsides, lawns, pastures.

Leaves.—Three leaflets, oblong or slightly ovate, thin, $1\frac{1}{2}$ - $2\frac{3}{4}$ inches by $\frac{3}{4}$ inch, silky beneath when young, with small stipules, stems short; leaf stems $1\frac{1}{2}$ -2 inches long. *Flowers*.—In axillary racemes 8 inches long or less, peduncles as long or longer, 4-8 distant 2-flowered nodes borne towards apex; each flower $\frac{3}{4}$ inch long. *Calyx*.—Green, $\frac{1}{5}$ inch long, tubular, with 5 nearly equal short teeth; bracteoles at base. *Corolla*.—Standard greenish-purple, rounded, recurved, $\frac{2}{5}$ inch wide; wings straight and free, $\frac{3}{4}$ inch long, exceeding other petals, dark-purple in upper part, as is keel, greenish below; keel produced into long, twisted beak. *Stamens*.—Upper 1 free. *Pistil*.—Ovary silky, style thickened above. *Fruit*.—Narrow, appressed-downy, nearly cylindrical pods, reflexed, 3-4 inches by $\frac{1}{7}$ inch, the thin valves twisting after opening; seeds numerous, oblong or angular, tiny, dark-brown, mottled, hilum short, oblong. *Home*.—Tropical America (Hillebrand); tropical regions (Kew Index).

WOOD-SORREL FAMILY

(Oxalidaceae)

Carambola (*Averrhoa carambola* Linnaeus). Figure 33.—In India and China the carambola is commonly cultivated for its fruit, in southern California a little. A few are growing in gardens in



FIGURE 33.—Wood-sorrel family: carambola (*Averrhoa carambola*), leaf, flowers, fruit in cross section.

Hawaii. It is a small tree, reaching a height of 20 feet and has dense evergreen foliage, each leaf consisting of several oval leaflets, which are more or less sensitive when touched. In June and July on the bare stems and branches clusters of tiny, sweet, pink-to-red flowers appear. It is said that fruit is borne on three-year-old trees, three crops a year in California, in Hawaii only one crop. The fruit is greenish-yellow, deeply five-angled, and a thin fragrant skin covers a watery, pleasant-tasting pulp. Two varieties are raised, one is acid and best to eat when preserved, the other is sweet and good when raw.—United States Experiment Station, upper end of Pensacola Street.

Leaves.—Alternate, odd-pinnate; leaflets 9-11, mostly alternate, ovate-acuminate, stalked, sensitive. *Flowers*.—In clusters on bare stems and branches, tiny, sweet, pink to red. *Calyx*.—Red. *Corolla*.—Bell shaped, 5 petals. *Fruit*.—Greenish-yellow, 2-3 inches long, 5-angled, forming a star shape when cut in cross section; skin yellow, thin, fragrant; pulp watery, sweet tasting, acid, containing several flat, brown seeds. *Home*.—Tropical America (Rock); India, China (Kew Index).

MALPIGHIA FAMILY

(Malpighiaceae)

Brazilian golden vine, orchid vine (*Stigmaphyllon ciliatum* A. Jussieu). Figure 34.—The orchid vine is a slender woody vine of medium size commonly planted in the United States on trellises. In Honolulu it is not common. It thrives best where protected



FIGURE 34.—Malpighia family: orchid vine (*Stigmaphyllon ciliatum*), leaves, flower, buds.

from strong sunlight and dry winds. Among the heart-shaped, hairy leaves clusters of attractive bright-yellow flowers form. These are made up of wavy petals and petal-like stigmas, from which the name *Stigmaphyllon* has been derived.—Upper tennis court, University of Hawaii.

Leaves.—Smooth, opposite, heart shaped, hairy, stemmed. *Flowers*.—Bright-yellow, large, in peduncled axillary clusters of 3-6. *Corolla*.—Petals 5, clawed, uppermost largest. *Calyx*.—Sepals 5-parted, joined at base, 8-glandular. *Stamens*.—Ten, 6 perfect, 4 antherless or deformed. *Pistil*.—Styles 3; stigmas produced into leaf-like or hooked appendages; ovary 3-celled, 3-lobed. *Fruit*.—Nuts, 3, dry, indehiscent, winged. *Home*.—Brazil.

RUE FAMILY

(Rutaceae)

Mock orange, orange jessamine (*Murraya exotica* Linnaeus). Figure 35, *b*.—Though ordinarily a shrub as high as 8 feet, the mock orange may become a tree 20 feet high. It is ornamental only, its tiny red fruit not being edible. Because of its rich-looking, shining foliage, which consists of small leaflets, and its sweet, white flowers, which appear between June and September and in mid-winter, the shrub is popular in Honolulu and in many other warm countries. In India, where it grows to elevations of 4,500 feet, it is considered one of the best odoriferous plants. When quite small it begins to flower.—2525 Jones Street; corner of Anapuni and Hastings streets; hedge in front of Army Service Club, beside Armory.

Leaves.—Evergreen, dense, pinnate; leaflets 3-8, ovate, shining, oblique, about 1 inch long, wavy, short stemmed. *Flowers*.—White, very sweet, a few in short cymes, 1/2 inch in diameter. *Calyx*.—Sepals 5, ovate or lanceolate, united in lower third. *Corolla*.—Petals 5, linear-lanceolate, free, overlapping. *Stamens*.—Free, 10, the alternate ones shorter, inserted on an elongated disk. *Pistil*.—Long style. *Fruit*.—Rounded, reddish berry, about 1/2 inch long, glandular dotted, 1-2 seeded. *Home*.—Tropical Asia, Australia, Polynesia.

Kumquat (*Citrus japonica* Thunberg). Figure 35, *a*.—Best known for its fruit, the kumquat grows as a low bush or shrub with smooth, angular branches and small, dense, dark leaves. It is sometimes grown in pots. Owing to scale and insects injurious to flowers and fruit it is rare anywhere in Hawaii. In Japan, California, and Florida many plants are cultivated for the sake of the small, sour fruit, which is borne abundantly. This is eaten raw or made into a delicious preserve and consists of a sour, rather scanty pulp and a sweet, aromatic skin.—United States Experiment Station, Pensacola Street.

Leaves.—Dark, dense, small, long and pointed, slightly finely toothed, base wedge shaped; stems short, narrowly margined with wings. *Flowers*.—Small, white, solitary or in clusters, in leaf axils, 5 petals. *Stamens*.—About 20, filaments united. *Fruit*.—Round or oval, about 3/4 inch in diameter; skin smooth, orange, thick, sweet, aromatic; pulp little, sour, in 5-6 cells, many seeded. *Home*.—Japan, China.

Chinese orange (*Citrus japonica* Thunberg var. *hazara* Hortorum).—The Chinese orange tree, which is both ornamental and use-

ful, is rather common in Honolulu because disease and scale do not injure it. The tree is of medium size, and some have thorns. The fruit is borne in more abundance than on most other kinds of orange trees (*hazara* means "thousand of fruit"), and both green and ripe fruit is present practically throughout the year. It is very juicy, very sour, and very seedy. As the fruit is good for flavoring and in drinks it is unfortunate that it is attacked by the Mediterranean fruit fly.—United States Experiment Station, Pensacola Street.



FIGURE 35.—Rue family: *a*, kumquat (*Citrus japonica*), leaves and fruit; *b*, mock orange (*Murraya exotica*), leaves, flowers, fruit; *c*, West Indies lime (*Citrus aurantifolia*), leaves, flower, buds, fruit.

It is said that the Chinese orange is given as a symbol of luck to a young Chinese husband when he calls on his bride's parents. It is also given to Chinese boys when they call on relatives or neighbors during the New Year's celebration. Philippine legend tells of a beautiful wife who was ill and longed for oranges, but she would not tell her devoted husband for fear he would lose his life in searching for them. Through strategy he found out what she longed for, and after braving many dangers he climbed an orange tree whose branches were sharp knives. He tossed an orange to his far-away wife, who ate it and grew better. But when she looked at the vine her husband had planted just before he left, she saw that it had withered and knew that he was dead.

Leaves.—Small, shining, shortly ovate, articulate, short stemmed. *Flowers*.—White, fragrant; like those of other citrus flowers. *Fruit*.—Round, deep-orange; skin smooth, loosely attached; pulp deep-orange, very sour, very juicy; seeds many. *Home*.—Japan, China.

Kona orange, Waialua orange, Polynesian orange, navel orange (*Citrus sinensis* Osbeck).—The Kona orange is a distinct kind of orange believed to have been produced by the Polynesians, who planted it on many Pacific islands, the original stock probably accompanying them from Southern Asia. In 1792, Vancouver is said to have brought it to Hawaii, possibly from Tahiti, and planted it in Hanalei Valley, Kauai. Later it was planted throughout the islands, where it prospered, especially at Kona, Hawaii, until the arrival of the Mediterranean fruit fly, which proved such a terrible enemy that soon whole orchards were exterminated. Under favorable conditions the tree is long lived; one, a similar kind, the "Grand Bourbon," planted in 1421 at Versailles, was living until a few years ago and may still be alive. The wood of trees 60 or more years old is valued highly, being durable, fragrant, beautiful.

Trees bear for 60 to 70 years fruit that is deliciously sweet and juicy, to the number of 3,000 a year on one tree. As the tree grows naturally 20 to 35 feet high, the top of most young plants is cut off to cause spreading. The best plants are obtained by budding orange cions on stocks of stronger kinds of citrus, as lemon and pomelo. Besides being eaten raw in several ways, the fruit has many products: the peel is candied and also yields an essential oil for flavoring and perfume, from the juice of the pulp lactic, citric, and acetic acids are extracted and marmalade and wine are manufactured. Perfume is also made from the abundant, fragrant flowers and a delicious honey. The sour orange (*Citrus aurantium*) is much less common in Hawaii than the Kona orange.—United States Experiment Station, Pensacola Street.

Leaves.—Oblong or ovate, acutely or obtusely pointed, alternate, articulate; stems narrowly or broadly winged. *Flowers*.—White and very sweet; much like other citrus flowers. *Fruit*.—Bright-yellow, round; skin coarse, leathery, thick, containing many oil glands; pulp juicy; seeds many, white, leathery coated. *Home*.—Southern Asia.

Pomelo, shaddock, grapefruit, forbidden fruit (*Citrus grandis* Osbeck).—The pomelo, commonly cultivated throughout the Tropics, from low elevations to as high as 4,000 feet, is a native of

southern Asia. It grows well in parts of Hawaii, where it was introduced many years ago, especially at the Hawaii Experiment Station in Honolulu. It is a small tiny tree 10 to 30 feet high and serves both as a stock for grafting oranges, being strong and hardy, and as a source of fruit. The greenish-yellow fruit resembles grapefruit, but is larger, ordinarily six inches in diameter or more, coarser, and drier. The pulp, which has few or no seeds and ranges in color from green to yellow to reddish, is good raw in salads and cooked in jam with the rind. The fruit can sometimes be found in the city markets, and it is especially popular among the Chinese, who always include it in their decorations for New Year's.

In the Hindu story, Punchkin, seven princesses went daily to weep over their mother's grave and whisper of their hunger and unhappiness. One day as they wept a beautiful pomelo laden with ripe fruit sprang up before their eyes, and they no longer had to eat dry bread, which was all their cruel stepmother would give them. The wicked woman persuaded her husband, the rajah, to cut down the tree and finally to abandon the girls in the wood. But they were found by seven handsome princes, who claimed them as their wives.

Grapefruit is a finer fruit than the pomelo, from which it is derived. It is said to excite the flow of the salivary and gastric juices and thus to stimulate the appetite. It is used as a breakfast fruit and cooked in preserves with the rind. The pulp ranges in color from pale-green to yellow and even to red. The Chinese have a satirical reference to its bitterness, "sweet like the grapefruit." Grapefruit is common in India and is cultivated for a commercial purpose in Florida, California, Jamaica, Cuba. The tree grows 15 to 30 feet high and has spreading branches. Because the round, pale-yellow fruits are borne in clusters like grapes the grapefruit is so called.—United States Experiment Station, Pensacola Street.

Leaves.—Ovate or ovate-oblong, blunt, some with notched tip, articulate, large; stem bearing 2 broad wings. *Flowers*.—White, large. *Calyx*.—Urn shaped, 3-5 cleft. *Corolla*.—Petals 4-8. *Stamens*.—Indefinite (16-24), filaments compressed and united at base. *Fruit*.—Pomelo: pale lemon-yellow, round or oval or pear shaped, 6-8 inches in diameter, weighing 4-8 pounds, rind bitter and very thick, pulp ranging from pale-green to yellow to red and slightly bitter; seeds several, few, or none. Grapefruit: Larger than an orange, skin smooth and thin, pulp juicy and bitter. *Home*.—Tropical Asia.

Mandarin orange (*Citrus nobilis* Loureiro).—The mandarin orange is a dense-crowned shrub or small tree that is cultivated both for its fruit and for ornamental purposes. In Japan, especially, some varieties are used for hedges. The leaves, twigs, and fruit, as well as flowers, of all the varieties have a characteristic odor, by which this orange may be distinguished from other kinds. The fruit is different, also, being nearly round and flattened on top and bottom, and the thin skin loosely attached to the rather dry but sweet and delicious pulp. The little seeds are green inside. In several places in Honolulu the Mandarin orange shrub may be found, especially in Chinese gardens. In all countries it likes low or medium elevations and does not thrive when subjected to hot winds. Common names of a variety are kid-glove orange or tangerine.—United States Experiment Station, Pensacola Street.

In Japan the song of the cuckoo and the fragrance of the blossom of the *tachibana* are often poetically associated. This is the mandarin orange tree, which is said to have been brought from Eternal Land at the request of the Mikado.

Leaves.—Dense, small, pointed ovate, margins slightly scalloped, stems short and scarcely winged. *Flowers*.—White and fragrant, small, in bunches; like other citrus flowers. *Stamens*.—Filaments only slightly united. *Fruit*.—Round but flat or depressed on top and bottom, about 2 inches in diameter; skin thin, orange to greenish-yellow, loosely attached to pulp; pulp rather dry, in 9-10 sections, which are loosely joined, sweet tasting; seeds oval or oblong, green when cut. *Home*.—China.

Lime [*Citrus aurantifolia* (Christmann) Swingle]. Figure 35, c.—The lime is the citrus fruit best adapted to the climate and soil of Hawaii, and it not only withstands drought but also many insect pests and fungus diseases. It will grow on poorer soil than most kinds of citrus and nearer salt water, but is more susceptible to cold. For many years the Mexican or West Indian lime has been cultivated and is said to be the commonest kind. Later, about 1885, a variety was introduced here from Kusaie, Micronesia, and now four or more varieties are cultivated, ranging in height from 6 to 15 feet. As they are much branched and some quite thorny, limes make good hedges, to which the shiny dark-green foliage and small but deliciously fragrant flowers add pleasing features. In the West Indies bees produce excellent honey from the flowers—of which Robert Nichols draws the following picture:

Sweet lime that often at the height of noon
 Diffusing dizzy fragrance from your boughs,
 Tasselled with blossoms more innumerable
 Than the black bees the uproar of whose toil
 Filled your green vaults . . .

Another use of the tree, known in India, is as a stock on which orange cions are budded. In their turn, limes may be grafted on some other species of citrus. Good grade fruit, which is highly prized for drinks and for the manufacture of citric acid, has colorless or transparent juice and few seeds. Large crops are raised in Hawaii, some trees when only four years old bearing about 400 limes, amounting to 40 pounds in weight. In some varieties the fruit ripens practically the year round.

A superstition is rather widespread that the lime is able to drive away evil. In Brunswick is an old lime tree full of nails, which have been put there by people who believed they would thus drive their toothaches into the tree. Lithuanian women sacrificed to lime trees. Among the Cheremiss of Russia trumpets made of lime wood are used in the annual ceremony of driving Satan out. Lime blossoms are gathered on St. John's Eve by Czechs and Moravians of Silesia to drive away evil.—United States Experiment Station, Pensacola Street.

Leaves.—Ovate or elliptical, shiny, dark-green, fragrant when bruised, articulate, short stemmed. *Flowers*.—Small, fragrant, white or pink tinged; like other citrus flowers. *Fruit*.—Like a small, sour orange, round or elliptical; skin light-yellow, oily, bitter; pulp juicy, sour. *Home*.—India.

Lemon (*Citrus limonia* Osbeck).—Lemons grow on shrubs or small spreading trees, succeeding especially at Kona, Hawaii, up to 1,500 feet, though many kinds of pests prevent much of the fruit from maturing. Large crops are raised in many other tropical or subtropical countries, especially in southern Europe, as lemons are one of the most important fruits of commerce, being used in food, candy, and lemonade, and in the manufacture of citric acid; the skin yields a valuable volatile oil and a flavoring, and it is also candied. In Hawaii only a few varieties are cultivated. Among them are the Eureka lemon, the best for this climate, and one with rough skin.—United States Experiment Station, Pensacola Street.

Legend tells of the son of a sultan in search of a bride "fair as the morning, white as snow, and pure as an angel." He was given three magic lemons and told to return home with them. When he cut the first a princess would appear and request water and he must give the water to her without hesitation or she would vanish. He cut the lemon, and the beauty of the princess so startled him that he hesitated and she vanished. The same happened with the second lemon. The third time he shut his eyes, cut the lemon, and handed the princess the water. She remained and consented to be his bride. But through a villainous negress she was killed. Three drops of her blood fell to the ground and grew immediately into lemon trees. When the prince cut the third lemon from these trees, his bride was restored to him.

In a legend of Bengal the ogres of Ceylon were said to dwell in a lemon. A boy found the lemon, and when he cut it in two all the ogres died. Malays believe that lemons are especially distasteful to spirits dwelling in tin; hence no lemons must be taken to the tin mines.

Leaves.—Ovate, pointed, margins scalloped or finely toothed, articulate; stem short, marginless, or slightly winged. *Flowers*.—White, small; like other citrus flowers. *Fruit*.—Elliptical, ending in a point; skin thin, yellow, aromatic, surface smooth or slightly irregular; pulp abundant, juicy, acid. *Home*.—India.



FIGURE 36.—Torchwood family: pili nut tree (*Canarium commune*), leaf and two kinds of fruit.

TORCHWOOD FAMILY

(Burseraceae)

Pili nut tree, Java almond, canarium (*Canarium commune* Linnaeus.) Figure 36.—Not common in Honolulu is a canarium, the kind of tree that forms one of the finest avenues in the world—Canarium Avenue, leading to the famous botanical gardens at Buitenzorg, Java. It is a slow-growing, medium to large-sized, long-lived tree, remarkable when well developed for its buttressed trunk and compressed basal roots, which before they enter the ground are so uniform in thickness and of such size that circular sections cut from them make good cartwheels. From the small flowers three-sided nuts develop, having an almond-like flavor and yielding an oil for lights and cooking. Among the Solomon Islanders these nuts could not be eaten until offerings were made to the ghosts of the tree.—Corner of Judd Street and Nuuanu Avenue: park at corner of King and Keeaumoku streets.

Leaves.—Alternate, pinnate; leaflets opposite, with odd leaflet at the end, oblong, broad, pointed, stalked. *Flowers*.—Small, in terminal panicles, unisexual. *Calyx*.—Three or 5-lobed. *Fruit*.—An elliptical nut with a thick, purple skin, which covers a hard, 3-sided, oblong stone, pointed at each end; kernel sweet-tasting. *Home*.—Moluccas.

CHINA-BERRY FAMILY

(Meliaceae)

Red cedar (*Cedrela australis* F. von Mueller).—The red cedar develops to greatest size on river banks and on fertile flats near rivers in districts near the northern coast of New South Wales. The name red cedar for this large, beautiful, brown-branched tree is misleading, as the tree is not a cedar and is not in all places evergreen. Its leaves are about a foot long and resemble, rather, those of the bean family, being divided into several leaflets. In their season long-stemmed flowers hang in bunches, which develop into small seed capsules, containing seeds so light that about 1,200 are required to weigh an ounce. The bark on the trunk scales off and discloses a reddish-brown surface. In New South Wales the most valuable timber produced is from red cedar, being a beautiful strong wood similar to mahogany but not so heavy. White ants seldom attack it. Besides serving similar purposes to mahogany, it is made into cigar boxes and burned for fuel. Ham smoked in its

burning sawdust is said to have an excellent flavor.—On Sugarloaf, beside the road.

In India is a similar tree, Indian mahogany (*Cedrela toona*), which is rare in Honolulu.

Leaves.—Alternate, nearly 1 foot long, odd pinnate, stem long; leaflets opposite, 15, thin to transparent, obliquely oblong or oval, base unequal and acute or upper side rounded, apex pointed, smooth on both sides, not more than 4 by 2 inches, short stemmed. *Flowers*.—In terminal panicles as long as the foliage, branches pyramidal and not dense, flowers on long pedicels. *Calyx*.—Sepals 5, obtuse, smooth or slightly ciliate. *Corolla*.—Petals 5, smooth, nearly elliptical, thin, tiny. *Fruit*.—Capsule, smooth, oblong, nearly 1 inch long; seeds light, thin. *Home*.—Australia.

Mahogany (*Swietenia macrophylla* King).—In Honolulu is growing a row of young mahogany trees, one of the kinds that supplies the hard, heavy, dark-red wood valued highly for furniture, interior finishing of houses, and ship-building. In Mexico it is commercially the most important species. Where living wild in tropical America the trees grow rapidly to considerable age and to medium or large size, in places unmixed with other kinds. Gum appears on the bark of some trees. Juice from the bark and young shoots is used medicinally in Mexico. In the dense, rich-green crown of compound leaves, small flower clusters form, later, oval, woody seed cases, which hang by curved stems and have caused the tree to be called "buzzard-head tree" in Mexico, where it is also called *caoba*. Formerly the Aztecs used oil from the seeds as a cosmetic, now it is used in soap.—Kalakaua Avenue, central plot at west end.

Leaves.—Abruptly pinnate; leaflets 3-5 pairs, smooth, pointed, opposite, stemmed, elliptic-oblong, 2 1/3-7 by 3/4-2 3/4 inches. *Flowers*.—Small, in axillary or somewhat terminal panicles. *Calyx*.—Small, 5-parted. *Corolla*.—Petals 5, spreading, ovate, 1/7 inch long. *Stamens*.—Staminal tube urn shaped, 10-toothed, anthers inside tube at apex. *Fruit*.—Capsule ovate, with a rather sharp projection, woody, opening at base, 6 by 3 by 3 inches, 5-celled; seeds about 12 in each cell, winged at the end, 3-4 inches long. *Home*.—Central America.

Pride of India, Indian lilac, Persian lilac, China-berry tree, bead tree, inia (*Melia azedarach* Linnaeus).—A native tree of the Old World, the pride of India, has become naturalized in the New World, being common in southern United States. In India it lives up to an elevation of 9,000 feet. It is much commoner on some of the other islands than on Oahu and grows well on lava flows at Honaunau, Hawaii. The tree is found in many wild parts of Ha-

waii, because mynah birds use in building nests stems bearing seeds. The first seeds planted in Honolulu are said to have been brought by Dr. G. P. Judd in 1850. As a shade tree it is desirable, for it is about 40 feet high and has wide-spreading branches that are bare for only a short part of the year. It develops fast; but its weak, coarse wood prevents the tree from enduring long. The wood is lasting for some purposes, however, as for musical instruments.

From March to June it is usually possible to find the small, pale-blue, fragrant flowers, which blossom profusely in graceful bunches. The fruit is also borne in abundance, and it decorates the tree for a long time with clusters of small golden balls. Cattle and birds eat the fruit, but it is said to poison human beings. It is packed with clothes or placed around plants to keep away injurious insects. The seeds inside the fruit are sometimes used as beads, and oil has been extracted from them. Some other parts of the tree have medicinal properties.—East side of Armory; Pauoa Road, near Nuuanu Avenue.

Leaves.—Bipinnate, 3-4 pinnae; leaflets 3-12, smooth, pointed, serrate to nearly entire. *Flowers*.—Pale-blue, fragrant, small, in graceful panicles, profuse. *Calyx*.—Sepals 5. *Corolla*.—Petals 5. *Stamens*.—Ten to 12, of 2 different lengths, each filament split but united in a tube with 20 teeth at apex, 10 anthers. *Pistil*.—Style 1, stigma 5-toothed. *Fruit*.—Yellowish, translucent drupe, 3/4 inch long, many; stone bony, 4-seeded. *Home*.—Region of the Himalayas.

SPURGE FAMILY

(Euphorbiaceae)

Snow bush (*Phyllanthus nivosus* Bull). Figure 37 c.—A hedge plant with variegated leaves and dark, wiry, zigzag branches, the snow bush, is common in Honolulu. Though only an inch or two long, its many white and green mottled leaves make the plant conspicuous. From the leaf axils hang small greenish flowers by long stems.

A variety (*rosco-pictus*) has red, pink, white, and green mottled leaves. It is sometimes called "sweet pea bush" because its leaves resemble the color of sweet peas. It is also called "Joseph's Coat."—Armstrong Street, near Vancouver Highway.

Leaves.—Mottled white and green (also red and pink in the variety), 1-2 inches long, obtuse. *Flowers*.—Small, greenish, discoid, hanging from leaf axils, male and female separate. *Fruit*.—Capsule. *Home*.—Pacific islands.

Macaranga [*Macaranga grandifolia* (Blanco) Merrill].—In tropical parts of the Eastern Hemisphere about 80 kinds of macaranga have been discovered. They grow as trees or shrubs. One kind has recently been planted in Honolulu that is taking the form of a tree, which may eventually become 15 feet high or more. Its huge, broad leaves are extraordinary for their size and also for the attachment of blade and stem, which is not at the edge of the blade but towards its center. The blade also has several large veins, which are red and prominent beneath, and it bears glands on its under surface. The flowers are small and clustered; the fruiting capsules are small, and each is armed with a pair of spines.—In front of Armory; grounds of Territorial Office Building.

Leaves.—Peltate, rounded ovate, 2 feet or more in diameter, many reddish when young; stipules 2 inches long or more; stems long. *Flowers*.—Female 1 or few under each bract; male many, minute, paniced; bracts oblong to lanceolate and 1-2 inches long; bracteoles ovate and pointed and less than 1/4 inch long, each at the base of several flowers. *Fruit*.—Capsules long stemmed, in dense round masses, smooth, about 1/3 inch long, consisting of 2 dehiscent, leathery cocci, each valve tipped with a pair of spines. *Home*.—Philippines.

Acalypha (*Acalypha wilkesiana* Mueller of Aargau). Figure 37, *a*.—Reddish-brown or bronzy leaves, some spotted with pink and yellow, form thick foliage for hedges of acalypha on many lawns in Honolulu. The leaves are also triangular and have toothed margins and long stems. The small, inconspicuous flowers grow on long spikes, some appearing in April and May. Roundish seeds form in small capsules. But the plant is ordinarily propagated from cuttings. From its home in the Pacific the plant has spread widely to other tropical countries.—Park, corner of Oahu and Kaala avenues.

Several varieties or distinct species of acalypha are growing as ornamental plants in hedges and on lawns in Honolulu. One, common at the Halekulani hotel, has green leaves and dark-red spikes of flowers (*A. hispida*), another has smaller leaves, green, edged with pink or cream and a red center, a third has green, white-margined leaves that become crimson (varieties of *A. wilkesiana*).

Leaves.—Large, triangular, edges toothed, alternate, reddish-brown or spotted with pink and yellow, long stemmed. *Flowers*.—Small, many, sexes on separate spikes; male: in long hanging strings, 4 sepals, 8 stamens, petals wanting; female: in shorter and larger, nearly erect spikes, sepals overlapping, 3 styles, petals wanting. *Fruit*.—Capsule, small, with 3 2-valved crustaceous cells; seeds nearly round. *Home*.—Islands of the Pacific.

Castor bean, castor oil plant, koli (*Ricinus communis* Linnaeus).—The castor bean is a common weed in waste places of all tropical lands; sometimes it is used decoratively. It is exceedingly variable in size, ranging from an herb 3 feet high to a shrub more than 30 feet, depending on its habitat. It is smooth and green and has large, handsome leaves, from half a foot broad to five times that size, in color green to dark-red, and ordinarily having seven broad, pointed lobes with toothed edges. The leaves are fed to silk worms in India and China. From flowers clustered at the ends of branches develop prickly or smooth seed cases containing seeds having a high percentage of oil. In Ecuador they are strung on sticks and used as candles. From earliest times oil has been expressed from the seeds—4,000 years ago by the Egyptians—and used for a lubricant, for lighting, medicinally as a cathartic, and in soap. The waste is a fertilizer. Today most of the seeds of commerce come from India.—In waste places, as empty lots.

Leaves.—Green to dark-red, alternate, 6-30 inches in diameter, ordinarily with 7 broad, pointed lobes with toothed edges, palmately divided, peltate, stems long. *Flowers*.—In terminal clusters 3-6 inches long, upper flowers female, lower male. *Calyx*.—Lobes 3-5, opening by valves, in males $\frac{1}{3}$ inch long. *Corolla*.—Petals lacking. *Stamens*.—Many in male. *Pistil*.—Female: 2-cleft and plumose. *Fruit*.—Prickly or smooth capsules $\frac{1}{2}$ -1 inch long, dividing into 2-valved cocci, varying in form and size; seeds rounded, varying in size and color and form. *Home*.—Probably tropical Africa (Standley); Tropics (Kew Index).

Kukui, candlenut tree [*Alcurites moluccana* (Linnaeus) Willdenow]. Figure 37, *b*.—A glance at the mountain flanks back of Honolulu reveals whitish spots, which mean clusters of pale-foliaged kukui trees. On all the Hawaiian islands they are common, prevailing in woods of the lower mountain zone. They are native here and also on many other Pacific islands, in India, and in China. The Chinese species have been introduced to America.

Alcurites is Greek for "floury," referring to the whitish down on the leaves, which are angularly pointed or lobed, somewhat like a maple leaf. The flowers, small, whitish, and crowded in large clusters, are the flowers of Molokai. The fruit is of much interest, and large crops are produced each year, 75 to 100 pounds of nuts on a tree. One or two nuts, with a black, bony shell, like an English walnut in shape, are contained in a strong covering. When



FIGURE 37.—Spurge family: *a*, acalypha (*Acalypha wilkesiana*), leaves, female and male flowers; *b*, kukui (*Aleurites moluccana*), leaves, flowers, nut; *c*, snow bush (*Phyllanthus nivosus* var. *roseopictus*), leaves, showing position of flowers; *d*, croton (*Codiaeum variegatum*), showing three forms of leaves; *e*, coral bush (*Jatropha multifida*), leaf, flowers, fruit.

green, this covering yields a black dye, formerly used by the Hawaiians, who also made into leis the black shells, which take a high polish. Today single shells are used as scarf holders. The white oily kernels were formerly dried, strung together, and used as candles. They are still eaten, serving as a relish after being baked, pounded, and mixed with salt and peppers, in that state being called *inamona*. More than a taste of the rich uncooked nut will make many people sick. The oil content is 65 per cent, and to remove the oil, the kernels are crushed raw or roasted, an excellent drying oil, like linseed, for varnish resulting. At one time in Hawaii 10,000 gallons of oil a year were exported; but the industry soon died, perhaps because of the difficulty of gathering and transporting the nuts, for the oil was of good quality.—Hastings Street near Manoa Road; school grounds on Beretania near Piikoi Street; grounds of Central Union Church.

The kukui is often mentioned in Hawaiian literature. Kaula married Kekele, whose breath and skin were as sweet as the food made of the kukui. The *menehunes*, or Little People, made tops of the nuts. When Makalii, god of plenty, was unable to see the shark that had swallowed his brother, he chewed some kukui nut and spat on the water which caused the water to clear. Moemoe, whose only desire was to sleep, was having a long nap when a stream rose and covered him with debris. His nose was sticking out and a kukui nut rested there and began to grow and tickle his nostrils. Moemoe woke up angrily and cried, "Here I am at my favorite pastime and I am awakened by this cursed kukui tree." He gave up trying to sleep and, we assume, began a useful life.

In speaking of the family ancestors, a Tahitian mother said to her son,

"The seed was sown. It budded; it blossomed.

It spread out and budded again and joined line on line

Like the candlenut strung on one stem.

'Tis lighted. It burns aglow and sheds its light o'er the land."

Hawaiian proverbs: "The gum sticks to the candlenut tree," refers to a parasite or to a child clinging to his mother. "When the kukui nut is spat on the water, the sea is smooth"; the meaning is apparently the same as "pouring oil on troubled waters."

Leaves.—Pale-green, 3-7 angularly lobed or pointed or entire, covered with a white down (especially on the under side), up to 8 inches long; stems long, with 2 glands at the top. *Flowers*.—Small, yellowish or whitish, in terminal lax clusters 4-6 inches long, with awl-shaped bracts, male and female separate, male clusters at ends of upper branches, female on thicker stems terminating lower branches, petals 5 and longer than the tubular 2-3 cleft calyx; male: calyx small and oval in bud, petals oblanceolate and bearded at base, stamens about 18; female: calyx larger, $\frac{1}{4}$ inch, petals long and narrow. *Fruit*.—Light-green, becoming dull-brown, round, 1-2 inches in diameter, strong covering containing 1 or more nuts with black bony shell like English walnut in shape and having 4 shallow furrows; kernel white, oily, solid, edible. *Home*.—Tropical Asia, Pacific islands.

Coral bush (*Jatropha multifida* Linnaeus). Figure 37, *e*.—As a shrub between five and ten feet high the coral bush is growing in a few places in Honolulu, as on the grounds of the University of Hawaii. It is commoner in parts of tropical America, its home, being wild in Jamaica. It can be distinguished easily by flowers and leaves. The flowers are red throughout and branch in a cluster like coral, and one or two rounded green fruits containing two or three seeds develop later from each cluster. The leaves are odd, being divided into about nine long, pointed lobes, some of which are also lobed, and are borne on long, slender stems.

Jatropha (*Jatropha podagrica* Hooker).—At most three feet high, a succulent jatropha from Panama is growing in several gardens in Honolulu. Its leaves are large and either undivided or somewhat lobed. The flowers are scarlet and coral shaped.

Physic-nut (*Jatropha curcas* Linnaeus).—A smooth tropical American shrub or small tree with milky juice and soft spongy wood, now found wild in the Old World, is called "physic-nut," for when the seeds are eaten the oil in them causes purging and vomiting. They have a pleasant taste, but are so poisonous that they sometimes affect people fatally. The oil from the seeds has been used also for lighting, in soap and paints, and as a lubricant. The leaves are three to five inches long, broadly heart shaped, some with the long stem attached within the margin. In the Philippines, it is said, they are used for stupefying fish, to aid in catching them. In clusters many small, yellow flowers are borne, and from them develop inch-long capsules. The plant is growing in several parts of Hawaii.

Ceara rubber tree (*Manihot glaziovii* Mueller of Aargau).—Many years ago in Hawaii rubber trees were planted with a view to raising them on a large scale for the sake of their milky juice. Owing to unfavorable conditions the plan did not succeed; but a few trees are still growing in Honolulu. Ceara rubber trees are found commonly in many parts of South America and in Florida and California. In Ceylon and India they are cultivated extensively and contribute considerably to the world's rubber supply.—United States Agricultural Experiment Station on way up to Tantalus.

According to Peruvian myth a descendant of the sun created man and woman. When man died the sun felt sorry for woman and gave her a son. Later, the creator of man and woman killed and buried woman's son, from whose teeth grew maize and from his ribs the long roots of the manihot.

Unsuccessful attempts were also made to raise the para rubber tree (*Hevea brasiliensis*) in Hawaii, and some trees are still growing on Maui.

Leaves.—Peltate, deeply 3-5 palmately parted or the upper entire, alternate; divisions entire, broad, ovate-lanceolate; stems long. *Flowers*.—In panicles, bracts small, hermaphrodite. *Calyx*.—Bell shaped or radiate, 5-lobed, overlapping in bud. *Corolla*.—None. *Stamens*.—Few, in 2 whorls in angles of the disk. *Fruit*.—Capsules 3-celled, 3-seeded. *Home*.—Brazil.

Croton, codiaeum (*Codiacum variegatum* Blume). Plate XV, A; figure 37, d.—The croton (not the true croton) is one of the commonest hedge plants and ornamental bushes in Honolulu. Its bright-colored foliage is very conspicuous, and wherever the plants are massed in clumps they are particularly attractive. They are large but seldom reach a height of 15 feet. The leaves have a wide range of color: red, orange, yellow, green, purple, and are plain or spotted. Their shape also is various: oblong, narrow, lobed, twisted, or wavy. All are thick and smooth and short stemmed. Flowers grow from leaf axils in slender clusters and are inconspicuous compared with the showy leaves. The juice of the plant stains indelibly.—Diamond Head Road, near terminus of Waikiki car line; Washington Place.

Leaves.—Bright-colored (red, yellow, orange, green, purple), plain or spotted, variously shaped (oblong, linear, lobed, twisted, wavy), alternate, thick, short stemmed. *Flowers*.—In axillary racemes about 10 inches long, slender, monoecious; male: white, several stamens surrounded by calyx and 5-6 small petals; female: 5-lobed calyx, petals wanting. *Home*.—Malaysia.

Poinsettia (*Euphorbia pulcherrima* Willdenow).—From November to February, when their bright-red floral leaves form rosettes at the ends of gracefully arching stems, looking like bursting sky-rockets, poinsettias are gorgeous in Honolulu. Here they grow from 2 to 12 feet high; in moist, shaded parts of their home land, tropical America, they grow much higher. They are propagated by cuttings, which are ordinarily set out in March, when the plants are cut back. Inconspicuous flowers form in bunches in the center of the red rosette, and each has one or two yellow glands. Some flowers are double, and some varieties have white or yellow bracts instead of red. The green leaves along the stem are lobed or toothed or fiddle-shaped. In the stems is a milky juice that is poisonous, in the bark and bracts a juice yielding a red dye.—Corner of Heulu and Keeaumoku streets (double flower); around Cooke Library, Punahou.

Leaves.—Upper ones broad, pointed, lanceolate, bright-red in flowering time; lower ones elliptical, lobed, toothed, or fiddle-shaped, 4-6 inches long, smooth or somewhat downy beneath, wider than upper ones, long stemmed. *Flowers*.—In terminal bunches, with 1 or 2 conspicuous yellow glands, small, appearing simultaneously with red floral leaves, involucre green or yellow, containing several male flowers and 1 female, both kinds much reduced. *Fruit*.—Capsule, separating into 3 two-valved cocci. *Home*.—Mexico.

Mexican fire plant, hypocrite plant, painted leaf (*Euphorbia heterophylla* Linnaeus).—A smaller plant, two to three feet high, less common than its relative the poinsettia, is the Mexican fire plant. Its leaves are similar in shape, but the upper ones are green, except for a bright-red spot at the base, and lobed, while the lower ones are entire. Varieties have white and yellow bracts. This plant runs wild in Honolulu and can be seen here and there in empty lots.

Crown of thorns (*Euphorbia splendens* Bojer). Figure 38, *a*.—An effectual hedge plant, reaching three feet in height and bearing on its stems quantities of strong, sharp spines, is the crown of thorns. Legend says that Christ's crown was made of this plant and that before it was worn by Him the flowers were white, afterwards red. It blooms nearly all the year, mostly in winter, and each flower is made conspicuous by a pair of bright-red, rounded wings. The branches, few and somewhat twining, bear a few leaves here and there on young growth only.—2552 Manoa Road.

Leaves.—Obovate, thin, bright-green, 1-2 inches long, few, on young growth only. *Branches*.—Functioning as leaves, green, bristling with sharp spines almost 1 inch long, somewhat twining. *Flowers*.—Involucres in long-stemmed dichotomous cymes, near end of branches, each subtended by 2 oval, bright-red, large bracts. *Home*.—Madagascar.

Euphorbia, milk-hedge (*Euphorbia tirucalli* Linnaeus).—Euphorbias have many widely different forms. One odd-looking kind grows quickly to a height of 6 to 20 feet as a smooth shrub or tree, and has numbers of cylindrical, slender, green branches. The leaves are tiny and few. In Africa and India, the milk-hedge grows wild. In India it is cultivated, and in Ceylon it is planted as a boundary for paddy fields.—Opposite Moana hotel.

Leaves.—Alternate, 1/2 inch long or more, few, soon deciduous. *Branches*.—Functioning as leaves, cylindrical, slender, smooth, ascending, nearly whorled, with twigs 4-8 inches long. *Flowers*.—Involucres single or few together, consisting of 1 pistillate flower surrounded by many staminate flowers. *Home*.—Africa and India.

Euphorbia (*Euphorbia antiquorum* Linnaeus). Figure 38, *b*.—A quickly growing euphorbia that resembles a cactus comes from dry, low, hot parts of India. It has been introduced to other warm



FIGURE 38.—Spurge family: *a*, crown of thorns (*Euphorbia splendens*), leaves and flowers; *b*, euphorbia (*Euphorbia antiquorum*), tip of stem, showing leaves; *c*, euphorbia (*Euphorbia pilulifera*), leaves and flowers.

countries and in the West Indies is used for hedges. As a shrub or small tree 8 to 30 feet high, some with a circumference of three feet, it raises many upward-curving, jointed branches, which are spiny, angled, and green, and contain milky, poisonous juice. They bear small leaves part of the year only. Old stems have thick, rough, corrugated, brown bark. It is believed in Annam that a branch of this euphorbia will cleanse a house of the evil brought to it by the taint of child-birth.—Grounds of Queen's Hospital; corner of Kinau and Keeaumoku streets; corner of Dominis and Kewalo streets.

Leaves.—Oval or round, smooth, fleshy, $1\frac{1}{4}$ - $1\frac{1}{2}$ inch long, deciduous. *Branches.*—Functioning as leaves, jointed, spiny, 3-5 angled, green, erect-spreading. *Flowers.*—Greenish-yellow, in short-stalked cymes of 3, sexes separate in the same flower; male: many, mixed with fringed bractlets; female: having 3 styles combined half way. *Fruit.*—Capsule, depressed and compressed, 3-lobed. *Home.*—India.

Euphorbia (*Euphorbia trigona* Haworth).—A rare euphorbia in Honolulu resembles *Euphorbia antiquorum*. But its leaves, each of which grows between two thorns, are shaped like spatulas. It is at home in dry, rocky places in the Deccan.

Euphorbia (*Euphorbia pilulifera* Linnaeus). Figure 38, c.—A euphorbia is a common weed not only in Honolulu but in most other tropical places. It lies along the ground or rises above it for six to eight inches, has few branches, bears yellow hairs along its stems, and contains milky juice. The oval, pointed leaves are paired, and at the base of their short stems are crowded minute flowers.—On lawns and roadsides.

Several other euphorbias are small common weeds in Honolulu, and the bitter milky juice of one prostrate kind, spurge weed or *akako*, the flowers of which are microscopical, is poisonous.

Leaves.—Opposite, ovate-rhomboidal or ovate-lanceolate, $1\frac{1}{2}$ inches by $\frac{1}{3}$ - $\frac{2}{3}$ inch, pointed, finely toothed, oblique or cuneate or truncate at base; stems $\frac{1}{12}$ inch long; stipules small, linear, not joined. *Flowers.*—Heads many, minute, crowded into headlike axillary cymes on short peduncles; involucre tiny, downy, smooth within, with 4 small entire glands, lobes triangular and fringed. *Pistil.*—Styles very short, bifid. *Fruit.*—Capsule tiny, bending down, downy, the seed cases keeled; seeds reddish, ovoid, obtusely angled, transversely wrinkled. *Home.*—American Tropics.

Shoe flower (*Pedilanthus tithymaloides*?). See page 309.

CASHEW FAMILY

(Anacardiaceae)

Mango tree (*Mangifera indica* Linnaeus). Figure 39, c.—In India, at the base of the Himalayas, the mango tree probably first bore its fruit, called “the king of fruits”—one of the finest and best-known of tropical kinds. There the trees grow at elevations up to 3,500 feet, in Honolulu best at low elevations. The tree reaches a height of 70 feet, and all the year its heavy, luxuriant foliage forms a dense top, furnishing abundant shade. It is resinous throughout, and the gum as well as the bark is used medicinally for an astringent. The rather narrow leaves are up to 10 inches long and have a turpentine odor when crushed. Young leaves are red. In Mexico the leaves and stems are used as brushes to clean teeth and harden gums. About January, large clusters of tiny flowers, densely covered with short yellowish hairs, begin to rise from branch ends, and between March and October the abundant pointed-oval fruits ripen. Their sweet, juicy pulp has a slight but not unpleasant taste of turpentine and is more or less fibrous, poor varieties especially so. Many mangoes are eaten raw, and many are eaten stewed and in chutney, jelly, and marmalade.

The first tree planted in Hawaii is said to be living still, standing behind the houses at the corner of Vineyard and River streets, where it was planted by Don Marin. It is a large tree and bears much small fruit. Though probably capable of being the parent of all mango trees in Hawaii it is not, other varieties having been imported later. More than 40 varieties are known in Hawaii, 500 in India:—Pauoa Road.

According to Hindu legend the daughter of the sun was fleeing from an enchantress. To escape her, the maiden threw herself into a pond and was transformed into a yellow lotus. A king saw the flower and longed to possess it, but the enchantress reduced it to ashes, from which sprang a mango tree. When the ripe fruit fell, the daughter of the sun emerged from it, and the king was amazed, for she was his wife restored to him. According to Burmese legend, at the time of a deluge two brothers embarked on a raft. The water rose until they reached heaven, where they saw a mango tree growing downward. While the younger brother climbed into the tree and ate fruit, the water subsided and left him hanging in the tree, where he may be to this day, for there the story ends.

Leaves.—Rather thick, 6-10 inches long, narrow, pointed, smooth, red when young. *Flowers*.—In large terminal panicles longer than the leaves, small, thousands on a tree, covered with short yellow hairs, disk tumid, whitish-green. *Calyx*.—Five tiny sepals. *Corolla*.—Four to five petals inserted at the base of the disk, 1/4 inch long. *Stamens*.—One or two fertile, 3-4 staminodia. *Fruit*.—Abundant, kidney-shaped, 4-5 inches long; skin smooth, green or tinted with yellow and red, resinous; pulp orange, sweet, juicy; seed case single, long, flattened, fibrous, ribbed longitudinally. *Home*.—India and Malaysia.

Cashew nut (*Anacardium occidentale* Linnaeus). Figure 39, *b*.—A close relative of the mango is the cashew nut from the West Indies, a spreading tree with thick, rough, oval leaves, pink, fragrant



FIGURE 39.—Cashew family: *a*, Christmas berry (*Schinus terebinthifolius*), leaves and fruit; *b*, cashew nut (*Anacardium occidentale*), leaves and fruit; *c*, mango (*Mangifera indica*), leaves and fruit; *d*, wi (*Spondias dulcis*), leaf and fruit.

flowers, and fleshy, edible fruit, to the tip of which is attached an oily, kidney-shaped seed. This seed or nut has a delicious flavor when roasted. The tree is rare in Honolulu, one growing at 1722 Dole Street.

Wi (*Spondias dulcis* Forster). Figure 39, *d*.—Here and there in Honolulu is the *wi*, a smooth-barked tree of medium size (up to 50 feet high), which bears large, glossy, compound leaves. Ordinarily, these fall in December, and the new supply does not appear until April. From the small, greenish-white clustered flowers develops the important product of the tree, the oval, yellow fruit. Though unpleasant-smelling, this has a palatable, somewhat fibrous pulp, in flavor resembling pineapples.—Corner of Keeaumoku Street and Wilder Avenue; north side of Hassinger Street; on Vineyard Street between River Street and Nuuanu Avenue.

Leaves.—Glossy, alternate, large, pinnate; leaflets ovate-lanceolate, edges toothed unequal at base, opposite, 11-13. *Flowers*.—Greenish-white, small, in panicles, on 1 tree both unisexual and perfect flowers. *Calyx*.—Five-fid, deciduous. *Corolla*.—Petals 5-valvate. *Stamens*.—Eight to 10. *Pistil*.—Styles 5, short. *Fruit*.—An oval drupe, 1-3 inches in diameter, smooth, yellow, unpleasant-smelling; a yellow and good-tasting pulp around a seed, from the bony covering of which fibers spread through the pulp; stone spongy to woody, hard, five-celled, one-seeded. *Home*.—All Tropics (Kew Index); south Pacific islands (others).

Hog plum (*Spondias lutea* Linnaeus).—When the yellow, oval fruits, each an inch or two long, are hanging in clusters from the branches of the broad-crowned, rough-barked hog plum, the tree is especially attractive. But the fruit does not have an attractive odor. Though the flavor of some varieties is aromatic and pleasant, that of others resembles, as Macmillan says, an "exceedingly bad mango." Some are eaten raw; some are preserved. The tree is widely distributed in the Tropics and perhaps came originally from the West Indies. In Honolulu it is fairly common. The wood is soft but strong and grayish-yellow. Young shoots, which have an exquisite odor, are good to use when bathing the body, and the bark, after being boiled, is used for the same purpose. From the roots it is said that water may be obtained. From amongst compound leaves, white, fragrant flowers grow in long clusters.—United States Experiment Station, Pensacola Street.

Leaves.—Opposite, pinnate; leaflets ovate-lanceolate, 5-9 pairs with an odd one at the tip, smallest at the base, nearly entire or toothed, smooth or nearly

so. *Flowers*.—White, fragrant, in a panicle 1/2-1 foot long. *Calyx*.—Four or 5 sepals. *Corolla*.—1/12 of an inch long, 4 or 5 petals. *Stamens*.—Eight to 10. *Pistil*.—Styles, 4 or 5. *Fruit*.—Yellow, oval, 1-2 inches long, smooth, unpleasant-smelling, hanging in clusters; aromatic-flavored pulp enclosing a seed. *Home*.—All Tropics, perhaps West Indies.

Pepper tree (*Schinus molle* Linnaeus). Plate XIV.—According to one authority the pepper tree is from Peru, where it was formerly called *mulli*, the source of *molle* in its scientific name. It grows in dry, sandy soil in many parts of South America, also in the Andes to an elevation of nearly 12,000 feet. In Mexico and in central and southern California it is one of the commonest shade trees, and it is very desirable except for one feature: it harbors the black scale, a pest of citrus fruit trees. In Honolulu it is a favorite for avenues.

The tree is smooth, graceful, evergreen, of small or medium height, and has slender, swaying branches. As the roots are weak, they will not resist strong winds. The leaves are long and lacy, each being composed of many narrow leaflets, which contain so much oil that when fragments are dropped on water they jerk about because of the discharging oil. Tiny yellowish flowers hang in conical bunches, which change to bunches of tiny rose-red berries. The fleshy covering of these contains an oil with a peppery flavor, and the seeds inside are sometimes ground up for pepper and also for adulterating pepper. In Mexico the tree is put to several uses. The fruit is ground for beverages, and an intoxicant is made from the fermented fruit; the leaves are chewed to harden gums and cure ulcers; the bark is used for tanning skins, and both the powdered bark and the bluish-white, bitter gum exuding from it are used medicinally to cure venereal diseases.—Nowewehi Street; Lunalilo and Kewalo streets; Kaala Avenue, opposite Kamanele Park.

Leaves.—Smooth, 9 inches long or more, pinnate; leaflets 15-27, alternate, narrow, pointed, 1 1/2-2 inches long, stemless, oily. *Flowers*.—Yellowish-white, small, in conical axillary and terminal panicles, sexes on separate trees. *Calyx*.—Five-lobed. *Corolla*.—Five overlapping petals. *Stamens*.—Ten. *Fruit*.—Bunches of small, rose-red berries, which contain a volatile oil, tasting like fennel and pepper mixed. *Home*.—Tropical America.

Christmas berry tree (*Schinus terebinthifolius* Raddi). Figure 39, *a*.—Beginning in early fall, dense clusters of bright-red berries form on Christmas berry trees and last well into December, when they are gathered for use in wreaths for the holiday season. The

trees, many of which spread their long branches at the edge of lawns, are sturdier than the closely related pepper trees, and the leaves are coarser. The small white flowers grow in clusters at the ends of branches and in leaf axils. Many of these trees are growing wild in the hills behind Honolulu, in places mixed with lantana. —Corner of Jones Street and Vancouver Highway; Kamanele Park.

Leaves.—Pinnate, having 7 broad, toothed leaflets, without stems. *Flowers.*—White, in axillary and terminal panicles, sexes on separate trees. *Calyx.*—Five-lobed. *Corolla.*—Five overlapping petals. *Stamens.*—Ten. *Fruit.*—Small, bright-red berries in dense clusters. *Home.*—Brazil.

SOAPBERRY FAMILY

(Sapindaceae)

Soaptree, manele (*Sapindus saponaria* Linnaeus).—The soaptree is so called because the seed contains a soaplike substance (37 per cent saponin) that forms a lather when mixed with water. In eastern countries and Mexico, even since the introduction of artificial soap, this is preferred for washing hair and delicate fabrics. The name *Sapindus* is Latin for "Indian soap." In Hawaii the seed is used for leis; in England for buttons; in Mexico for necklaces and rosaries, medicinally for fevers and rheumatism, and also for stupefying fish so that they can be caught easily. Ordinarily the tree is small, but in Mexico it reaches a height of 50 feet, and its rough, gray trunk is two feet in diameter. The top is broad and densely foliated, and from the ends of the branches large clusters of tiny flowers appear in their season. Though dense the wood, which is light-brown, is little used except for fuel.—Park, corner of King and Keeaumoku streets.

Leaves.—Alternate, abruptly pinnate; leaflets 4-17, opposite or alternate, oblong-lanceolate, acute to elliptic-ovate, somewhat obtuse, entire, smooth, veined and shining above, woolly beneath, 2-7 inches long; rachis ordinarily winged. *Flowers.*—White, tiny, in large terminal clusters; 2 sexes on separate trees or both perfect and unisexual flowers on the same tree. *Calyx.*—Sepals 5, obtuse. *Corolla.*—Petals 5, more or less downy, with hairy appendage just above short claw. *Stamens.*—On an annular, scalloped disk, 8-10. *Fruit.*—About 1/2 inch in diameter, black, shiny if rubbed, hard; pulp yellow and translucent, soaplike; seed single, brown. *Home.*—Warm parts of Western Hemisphere.

Litchi (*Litchi chinensis* Sonnerat). Figure 40.—The litchi, a thick-foliaged, medium-sized fruit tree, which is being cultivated widely, was first brought to Hawaii in 1873 and is now established

in several gardens. In Honolulu a good tree bears 200 pounds or more of fruit during May and June, some beginning when 5 years old, some not in 20 years. The fresh fruit is rare and highly prized for its delicious flavor, selling for 50 to 75 cents a pound. In this condition it is seldom seen east of the Philippines. But the dried fruit, called "litchi nuts," is shipped long distances. In China this is prepared by drying in the sun or artificially. Much is also canned in syrup, when, like the fresh fruit, the pulp has the consistency of Muscat grapes. The dried fruit is quite different—reddish-brown, sticky, shrunken, sweeter. The large seed enclosed in the pulp of each is short lived, dying four or five days after picking. Litchis need considerable moisture. They resist frost somewhat, but succumb to several insect pests.—Corner of School Street and Nuuanu Avenue.



FIGURE 40.—Soapberry family: litchi (*Litchi chinensis*), leaf and fruit.

A close relative of the litchi is the longan (*Euphoria longana* or *Dimocarpus longana*), which may grow to be a rather large tree. It is rare in Honolulu; but its fruits, called "dragon's eyes," which are similar to litchi nuts, are served in Chinese restaurants. They have been sent from China in cans.

Leaves.—Pinnate; leaflets in 3 pairs, nearly opposite, 2-5 inches long, narrow, oblong, pointed, leathery, indistinctly veined, dark-green, whitish beneath. *Flowers*.—Pale-green, small, regular. *Calyx*.—Small, valvate. *Corolla*.—Lack-

ing. *Fruit*.—Reddish, about the size of an English walnut, in bunches; skin parchment-like, rough with soft spines and tubercles; pulp within juicy, sweet, white, delicious, on drying shrinking and turning brown: seed single, large. *Home*.—Southern China.

BUCKTHORN FAMILY

(Rhamnaceae)

Jujube tree (*Zizyphus jujuba* Lamarck).—Through dry parts of the eastern Tropics the jujube tree is distributed. It grows to an elevation of 4,500 feet in the Himalaya Mountains, is common in China and rare in Hawaii. Fifty feet is tall for this tree. Ordinarily it is provided with many thorny branches and woolly branchlets. The bark is dark-gray and deeply grooved longitudinally. Blunt, oval or oblong leaves form beautiful foliage, which is eaten in India by silk worms. Small, whitish flowers grow in clusters and form small, nearly round, red-to-yellow fruits, which are bitter tasting when raw, very palatable when preserved. The wood is hard, heavy, reddish-brown.—Near Lincoln School, Beretania Street; 1714 Beckley Street.

Leaves.—Broadly ovate to oblong, obtuse, some notched at the tip, serrate, or entire, dark-green and smooth above, yellowish or whitish woolly beneath, 1-3 inches long, alternate, 3-5 veined, rounded at both ends: stems short, rusty woolly. *Flowers*.—Many in small, axillary clusters, rusty woolly, greenish or whitish, stem hairy. *Calyx*.—Obconical, 5-lobed tube, lobes pointed, woolly outside. *Corolla*.—Petals 5, very small, spatulate, recurved, disk 10-lobed and 10-grooved. *Stamens*.—Five, joined to base of petals. *Pistil*.—Ovary 2-celled: styles joined half way up, 2 to 3 parted. *Fruit*.—Subglobose to oblong, red to yellow, 1/2-3/4 inch long, drupelike, edible, mucilaginous, bitter raw; stone 2 celled, brown, surface excavated. *Home*.—East Indies and Malaysia.

GRAPE FAMILY

(Vitaceae)

Isabella grape, fox grape, skunk grape (*Vitis labrusca* Linnaeus).—The most popular grape in Honolulu is the Isabella, which has long been growing in North America and is the parent of most cultivated kinds there. The vine climbs vigorously and high on trees or arbors or other supports. In contrast to the darker, older stems, the young shoots are yellowish and downy and tendril bearing. The large, thick leaves are subject to insect pests. Flowers are not conspicuous. The chief interest of the plant to man is the fruit, whose sweet, juicy pulp is delicious.

In China it is said that grapes were the first fruits of the earth. Men who ate sparingly of them retained their whiteness; those who ate greedily became the dark peoples. When the Japanese Adam went to the underworld to rescue his wife, who was surrounded by witches, the witches chased him. He threw back the wreath from his head and it became grapes, which they stopped to devour. In classical mythology Bacchus, the god of wine, is pictured as wearing a crown of grape or ivy. The emblem of the state of Connecticut is the grape.—Kalihi Valley; Kaimuki; Moanalua.

Leaves.—Round to heart shaped, with 3 or more prominent points or lobes towards the top, thick, large, dark-green on top, whitish or reddish and felt-like underneath, veins prominent, especially beneath, margins scalloped and bearing short teeth; stems long. *Flowers*.—In short racemes, ordinarily the 2 sexes on separate plants, some perfect, some sterile. *Calyx*.—Entire or 4 or 5-toothed. *Corolla*.—Coherent in a cap, caducous, 5-parted. *Stamens*.—Long and erect in sterile flowers, short and recurved in fertile ones, alternating with 5 nectiferous glands. *Fruit*.—In thick, short clusters, dark-blue covered with a bloom; skin thick, tough; pulp sweet, juicy; seeds round, large, thick, pear shaped, 1-4. *Home*.—North America (Kew Index).

MALLOW FAMILY

(Malvaceae)

Flowering maple, mao (*Abutilon molle* Sweet). Figure 41, c. —On tall, fuzzy stems with heart or maple-shaped leaves the orange-yellow flowers of an abutilon are a rather common sight along roads in the outskirts of Honolulu. They look like *ilima* flowers, but the plant differs in many ways. The seed cases are odd and almost as conspicuous as the flowers, being black and wheel shaped and having beaklike projections around the rim. Abutilons are found in the same environment and the same countries as *sidas*, most commonly in America. The Hawaiian name, *mao*, has been given to this plant because it resembles the native cotton, also called *mao*.—On roadsides and in fields.

Leaves.—Heart shaped or maple-like, long stalked. *Flowers*.—Axillary, solitary, orange-yellow. *Calyx*.—No involucre, naked, 5-cleft, large, persistent. *Corolla*.—Petals 5, obovate, separate petals and stamens as in *Sida*. *Stamens*.—Many, in column ending in filaments. *Pistil*.—Style branches of the same number as the carpels. *Fruit*.—Carpels several, surrounded by large conspicuous sepals, when ripe joined below, separated at top and opening into 2 valves on back and top, beaked; about 3 seeds in a carpel (1 in *Sida*). *Home*.—Peru.

False mallow, hauuoi [*Malvastrum coromandelianum* (Linnaeus) Garcke]. Figure 41, *b*.—Probably the commonest roadside weed in Hawaii is the false mallow, found extensively in warm countries



FIGURE 41.—Mallow family: *a*, *ilima*, red-flowered variety (*Sida fallax* var.), leaves, flower, bud, seed case; *b*, false mallow (*Malvastrum coromandelianum*), leaves, flower, fruit; *c*, *mao* (*Abutilon molle*), leaves, flower, seed case.

throughout the world. The largest grow a yard high, and all are woody shrubs, their many reddish stems and branches dotted with coarse, flat-pressed hairs. The oval, toothed leaves are also hairy. Little orange flowers appear a few at a time, and when their petals fall their center begins to enlarge, finally forming a wheel-shaped "cheese," which is divided by 8 to 12 spokelike ridges bearing bristles. This fruit resembles that of the cheese weed or malva, at least one kind of which is also common by roads in Hawaii. The false mallow has slight value as fodder, usually being avoided even by sheep and goats. It is said that Hawaiians pound it up with

salt for poultices and that in some parts of the West Indies it is made into brooms.—On roadsides.

Leaves.—Ovate to lanceolate, $1\frac{1}{2}$ -3 by $\frac{1}{2}$ - $1\frac{1}{2}$ inches, bluntly toothed, hairy, veined like a feather; stems $\frac{1}{2}$ -1 inch long. *Flowers*.—Few, small, in bunches of 2 to 3, crowded towards ends of branches or together at nodes; involueral bracts 3, awl shaped to lanceolate, nearly as long as calyx; stems about $\frac{1}{4}$ inch long. *Calyx*.—Green, $\frac{1}{3}$ inch long, nearly as long as petals; lobes 5, ovate, long pointed. *Corolla*.—Petals 5, exerted, orange. *Stamens*.—Tube ending in filaments. *Pistil*.—Style branches as many as carpels. *Fruit*.—Capsule made up of 8-12 angular carpels, kidney shaped, bristle haired, having a subterminal and 2 dorsal projections, opening by a narrow slit; seeds single, dry, small, kidney shaped. *Home*.—America (Hillebrand), cosmopolitan Tropics (Kew Index).

Ilima (*Sida fallax* Walpers, variety). Figure 41, *a*.—In many parts of Hawaii, from near sea level to an elevation of more than 2,000 feet, various forms of *ilima* plants, four feet or less high, open their bright flowers, which range in color from yellow to rich-orange to dull-red. Formerly commonly strung in leis in their fresh state, they are rarely seen now, for orange paper leis—much less laborious to make—have taken their place. Twined about with *maile*, they are a favorite sign of welcome or farewell on steamer days. The *ilima* is also found in other parts of the Pacific. Including their oblong or heart-shaped leaves and even the wide wheel-like seed cases, the plants are covered ordinarily with white velvety hairs. Cultivated plants grow large, and formerly the Hawaiians made from the stems slats to use in building houses.—By roads; in waste land; near Bishop Hall, Punahou.

The *ilima* is the flower of Oahu. It was said to be one of the forms that Laka, goddess of the hula, could take at will. A Hawaiian riddle: "In the evening gathered; in the morning pierced; in the forenoon, hung in the air." Answer: "An *ilima* lei."

Leaves.—Broadly oblong, blunt or rounded, some slightly heart shaped, edges scalloped, smooth and green on top, rather thick, prominent straight veins, $\frac{3}{4}$ - $1\frac{1}{2}$ by $\frac{1}{3}$ -1 inch; stems $\frac{1}{4}$ - $\frac{3}{4}$ inch long. *Flowers*.—On solitary stalks or rarely 2-3 together, crowded towards the ends of the branches. *Calyx*.—About $\frac{1}{4}$ inch long, with woolly hairs, leathery, angular, 10-ribbed at base, 5 blunt lobes. *Corolla*.—Yellow, twice as long as the calyx. *Fruit*.—Carpids 7-12, hard, pale, less than $\frac{1}{6}$ inch long, wrinkled on back, their sharp beaks diverging after opening, ordinarily hairy.—*Home*.—Hawaii.

Hau (*Hibiscus tiliaceus* Linnaeus). Figure 42, *a*.—One of the first trees to strike the attention of newcomers to Hawaii is the thick-foliaged hau, which also inhabits tropical countries of the Old

World and has been introduced to the West Indies. Though in some places it is an erect, gnarled, and crooked tree of low or medium height, in other places it spreads horizontally over the ground, if in thickets, forming an apparently impenetrable network of trunks and branches. The round, heart-shaped leaves vary greatly in size in different habitats, are leathery, on top nearly smooth, beneath white with matted hairs. The flowers, which grow in profusion, open as bright-yellow cups, some with brown or purple centers. Later in the day they change to dull-orange, and by night to dull-scarlet. They do not cross with other kinds of hibiscus.—Halekulani and Royal Hawaiian hotels; along road in Nuuanu Valley near the Pali.

In former times, the hau was a useful tree to the Hawaiians, its light, tough wood being used for cross-sticks of kites and outriggers of canoes, its flowers for medicine, having laxative properties, and the fiber of its inner bark for ropes, net bags, tapa. In Tahiti it furnishes a useful fiber, and the plant is called *fau* or *purau*. The Tahitians also make the leaves into plates and covers for ovens. In Samoa the bark is used even today for straining the narcotic drink ava, and the fiber is made into *siva* skirts. In Mexico the wood is used for cork and cordage, the flowers, roots, and bark medicinally. Australian natives use roots and leaves for food. Hawaiian legend says that the hau is the visible form of the Manoa wind. Another myth states that a sister of Hina was changed into a hau tree. Tahitians say the hau is the grandchild of heaven and earth.

Leaves.—Round heart shaped, abruptly short pointed, margins entire or slightly scalloped, about 2 1/2-12 inches in diameter, under side white with matted hairs, nearly smooth above, palmately 7-9 veined, the 3 middle veins with a gland near the base; stem 3-6 inches long. *Flowers*.—Bright-yellow, 2-3 inches long, many in upper axils or at ends of branches with one to several flowers; stems short; involucre bell shaped, half the length of calyx, divided to middle into 10-12 acute lobes. *Calyx*.—Nearly 1 inch long, 5 pointed lobes joined for a third of the way, woolly hairs. *Corolla*.—Petals large, yellow, some brown at base. *Stamens*.—Column yellow, 1 1/4 inches long, filaments short. *Pistil*.—Stigma yellow or dark-brown, 5-lobed. *Fruit*.—Capsule about 1 inch long, pointed, hairy, opening into 5 valves, 3 naked seeds to a cell. *Home*.—Old World Tropics.

Roselle, Jamaica sorrel, red sorrel (*Hibiscus sabdariffa* Linnaeus). Figure 42, c.—Throughout the Tropics and in southern Florida and southern California a showy bush, the roselle, is culti-

vated and is sometimes found wild. It grows well in moderately dry climates from near sea level to an elevation of 2,500 feet. The plant ranges in height from about four to seven feet, is smooth, and has reddish, nearly cylindrical stems. In Ceylon the stems furnish a strong fiber, and the young tender leaves, which have a somewhat acid flavor, furnish a vegetable for curries. The leaves differ in shape, the lower ones being oval, the upper divided into five or more lobes. The roselle is noted for its fruit, which is made into tarts, jelly, jam, and an acid drink, which has a flavor resembling cranberries or currants. From unripe fruit pickles are made and also "sorrel-drink." For all these purposes the plant is perhaps most widely cultivated in the East Indies and the West Indies. A variety called "white sorrel" has greenish-white fruit.—United States Experiment Station, Pensacola Street.

Leaves.—Ovate, undivided at base; above, digitately 5-parted, the side lobes of some lobed again, lobes lanceolate-oblong and notched, light-green or reddish; stems long. *Flowers*.—Solitary, axillary, bracts red and thick, almost sessile. *Calyx*.—Red, fleshy, less than half as long as corolla. *Corolla*.—Petals 5, yellow. *Fruit*.—Fleshy calyx, bluntly triangular. *Home*.—Old World Tropics.

Red hibiscus, Chinese hibiscus (*Hibiscus rosa-sinensis* Linnaeus). Figure 42, c.—The red hibiscus is the commonest kind used for hedges in Honolulu. It is now cosmopolitan, even growing in the Temperate Zone, where it is commonly cultivated in greenhouses. If not pruned, the shrub will grow as high as 20 feet. The bark, which is nearly or entirely smooth, yields a strong fiber, and in China it is used medicinally. Rose-red, cup-shaped flowers bloom singly on long stems, and from the center of each projects a long, pale-crimson column bearing pollen. The color of the petals varies, in different plants being orange, yellow, magenta, and parti-colored. Some plants bear single, some double flowers, and in the double the pollen-bearing column is modified into several petals. Few double flowers seed.

When crushed, the petals turn black, yielding a purplish dye, and they are used in India for blacking shoes (hence the name "shoe-black plant"). In China the color is extracted for use by women in dyeing hair and eyebrows. It is also used to color liquors and to dye paper a bluish-purple tint, which reacts like litmus. Occasionally, Hawaiians eat the flowers, which are believed to benefit



FIGURE 42.—Mallow family: a, hau (*Hibiscus tiliaceus*), leaves, flower, green and empty pods; b, coral hibiscus (*Hibiscus schizopetalus*), leaves and flower; c, red hibiscus (*Hibiscus rosa-sinensis*), leaves and flower; d, changeable rose mallow, double form (*Hibiscus mutabilis*), leaves, flower, bud, empty seed case; e, roselle (*Hibiscus sabdariffa*), leaves and fruit.

the digestion; in China the flowers are pickled and eaten.—Corner of Wilder Avenue and Punahou Street.

The red hibiscus was doubtless considered a sacred flower in Polynesia, for an early writer speaks of a native being clubbed to death for wearing this flower over his ear in front of a temple. A Polynesian myth tells of a beautiful woman whose beauty was destroyed by a witch; her hair and brows were restored by the juice of the hibiscus. According to Tahitian lore the hibiscus was created from a ruddy face of man. "Trim is the hibiscus flower of Kalena," is a saying that refers to a fop.

Leaves.—Broadly ovate pointed to lance-ovate, tapering to base, thin, shining, coarsely toothed, 3-4 1/2 by 2-4 inches, slightly downy beneath; stem 1-2 1/2 inches long. *Flowers*.—Solitary, in upper axils of new growth, ordinarily crimson with darker crimson eye, 4-5 inches in diameter; stems longer than leaf stems; some double, extra petals formed from stamens; color ranging from yellow to magenta or parti-colored. *Stamens*.—Column pale-crimson, 3 1/2 inches long. *Pistil*.—Stigma darker crimson. *Fruit*.—Capsule, dry, more or less dehiscent; rarely seeds in Honolulu. *Home*.—Probably China.

Coral hibiscus (*Hibiscus schizopetalus* Hooker). Figure 42, b. —One of the prettiest kinds of hibiscus is the coral hibiscus, a graceful shrub about 12 feet high. Hanging downwards on long, slender stems from the branches are many rose-red flowers that bloom the year around. The petals, which have finely indented yellow and whitish margins, curve upwards and backwards, thus emphasizing the length of the slender, red column, which bears pollen near the end of its curved tip. The pollen of this hibiscus is often used in Honolulu for producing new varieties. The bark is smooth and dark-gray; the leaves, oblong or elliptical and pointed, are scattered along the shortly branched stems, which radiate stiffly upwards from the ground. The coral hibiscus is cultivated in many tropical countries. In Honolulu it is much used for hedges.—Kellett Lane; Keeaumoku Street between Kinau and Beretania streets.

Leaves.—Oblong or elliptical, pointed, margins toothed or entire, smooth, dark-green, sparse. 1 1/2-3 by 1/2-1 1/2 inches; stem 3/4 inch. *Flowers*.—Axillary, single, hanging downwards; stem long and slender, 2 1/2 inches in diameter. *Calyx*.—Narrow. *Corolla*.—Red, curved back, finely divided into narrow lobes, fringed with yellow or white. *Stamens*.—Slender tube, 3 inches long, hanging far below petals, tip recurved. *Pistil*.—Stigmas minute on slender branches. *Fruit*.—Capsule, long, bearing smooth seeds. *Home*.—Tropical Africa.

Changeable rose-mallow, fuyo (*Hibiscus mutabilis* Linnaeus). Figure 42, d.—A Chinese shrub hibiscus cultivated in most warm countries is known in southern Florida as "cotton rose" and "Confederate rose." Its beautiful flower, which is cup shaped, is of unusual interest, as it is white on opening in the morning and during the day changes to pink or red. In Japan this hibiscus is called *fuyo* and symbolizes a fascinating but fickle woman. Some plants bear double flowers. But neither single nor double crosses with other kinds of hibiscus. The shrub grows 15 feet high, has large leaves, and is highly ornamental, especially when blooming well. A useful, strong fiber is obtained from the bark. The plant is not very common in Honolulu.—Vancouver Highway near Armstrong Street; in some gardens.

Leaves.—About 8 inches long, 5 or 6-pointed, margins toothed, downy. *Flowers*.—Borne in axils of leaves, 4 1/2 inches in diameter; white on opening, changing to pink or red during the day; some stems more than 5 1/2 inches long. *Fruit*.—A dry, 5-loculed capsule. *Home*.—China.

Pink hibiscus (*Hibiscus cameroni* Knowles and Westcott).—One of the commonest kinds of hedge hibiscus has handsome, wide-spreading flowers, which are larger than those of the common red hibiscus and in color are a medium pink, except for a white area near the base of each petal. The long pollen-bearing columnar formation in the center is crimson and curves downwards. This flower is used much in crossing with other kinds of hibiscus to produce new varieties of flowers. The plant is vigorous, much branched, and well foliated. The bark is green on the twigs, elsewhere dark-gray.—Common in hedges, as at 1428 Piikoi Street.

Leaves.—Ovate or cordate, dentate, smooth, dark-green, shiny, 2 1/2-4 1/2 by 2-4 inches; stem 1 inch long. *Flower*.—Medium crimson-pink, 7 inches wide, one side of each petal whitish near base, opening widely; stem 4 inches long. *Stamens*.—Column medium crimson, 3 1/2 inches long, curved downwards. *Pistil*.—Stigmas 5, spreading, deep-crimson. *Fruit*.—Similar to that of other hibiscus. *Home*.—Madagascar.

Hibiscus, kokio keokeo (*Hibiscus arnotianus* Gray).—A small tree or tall shrub, 10 to 25 feet high, with a dense crown of foliage is the general appearance of a native hibiscus that grows in Hawaii at elevations from 1,000 to 3,000 feet in wild places, on mountain slopes or on the sides of rocky ravines. Its stem and branches are smooth; its leaves are oval and blunt, with plain or scalloped edges. The flowers have an exquisite fragrance, and when in full bloom

the shrubs are beautiful: delicate white petals surround a long conspicuous red column bearing pollen. This hibiscus has been much used as one of the parents in producing new varieties of hibiscus. Formerly it was more accessible or more common than now, as it is referred to in many old Hawaiian songs and legends.—5236 Manoa Road.

Leaves.—Ovate, 2-3 1/2 by 1 1/2-2 inches, blunt, entire or undulate and scalloped margin, 3-veined, papery; stems 1-1 1/2 inches long. *Flowers*.—White, fragrant, solitary in axils of 2 uppermost leaves; stems 1/2-1 1/2 inches long; involucre bracts 5-7, triangular to lanceolate, 1/4 inch long. *Calyx*.—Thin, tubular, 5-toothed, 2/3-1 inch long. *Corolla*.—Delicate, oval, long clawed, 3-4 inches long, downy below. *Stamens*.—Red, on column 4-6 inches long; filaments branching off on upper half or third. *Pistil*.—Style branches about 1/4 inch long, erect. *Fruit*.—Capsule elongate, papery, as long as calyx; seeds 1/4 inch long, kidney-shaped, covered with short brown wool. *Home*.—Hawaii.

Hibiscus, hauhele (*Hibiscus youngianus* Gaudichaud).—In several ways another native hibiscus, which is found in marshy land, differs from *kokio keokeo*. It is a small shrub two to three feet high with few branches. Though some of its leaves are heart shaped or oval, others are three to five-lobed and have seven veins. The flowers are pink, smaller, and have notched petals; the stamens, borne on a column half as long as the petals, have pollen-bearing organs along their entire length. The seeds are smooth and smaller. In Honolulu examples are cultivated here and there, as at the Country Club and in Kalihi Valley.

Rose of Sharon, shrubby althea (*Hibiscus syriacus* Linnaeus).—A so-called "althea" is not common in Honolulu. Ordinarily it is a shrub that grows 6 to 12 feet high and has many smooth or nearly smooth branches, bearing lobed or toothed leaves. It resembles other kinds of hibiscus in many ways. But the flowers are distinguishable, being more nearly bell shaped, smaller, and of an unusual color, ranging from rose to purple to white. The plant grows best at high elevations.—Several gardens, as at 2144 Manoa Road.

Leaves.—Triangular or rhombic-ovate, mostly 3-lobed and with many rounded teeth or notches, rather small, strongly 3-ribbed, short stemmed. *Flowers*.—Solitary in axils on young wood, somewhat bell shaped, 2-3 inches long, rose or purple, ordinarily darker at base. *Fruit*.—Capsule short, splitting into 5 valves. *Home*.—Tropical Eastern Hemisphere.

The hibiscus is one of the most outstanding flowers of Hawaii. More than 33 varieties have been brought from other countries, and by crossing these with one another and with three native species, more than 5,000 horticultural varieties have been produced. But some kinds will not cross. So much interest has been taken in breeding plants with different colors of flowers that in 1911 a hibiscus society was formed—unfortunately a short-lived organization. In 1923 a law was passed making the hibiscus the flower of Hawaii. As seedlings of hybrids vary greatly, grafting is often employed for preserving certain kinds of flowers. Hibiscus shrubs bloom practically the entire year, best after heavy rains. The flowers of most open early in the morning, a few later, and after closing near sunset, die; a few kinds last three days. If picked and placed in water they last as long as if not in water—through the day. It is a common practice in Hawaii to make bouquets by mounting the flowers on midribs of coconut leaves and to group them in flat decorations on tables. Sometimes the buds are picked in the early morning, put in the ice-box, and brought out to open in the evening. The plants vary, from low shrubs to trees, and have from few to many branches, from leaves at tips only to leaves scattered along the branches, from smooth to rough leaves. In Plate XV, *A*, one of the varieties is shown. The Hawaiian name for the hibiscus blossom is *pua aloalo*.

Milo (*Thespesia populnea* Correa). Figure 43, *a*.—Along beaches in the Tropics, from Madagascar to Hawaii, the nearly cosmopolitan *milo* is at home. Formerly more common in Hawaii than at present, it was popular as a shade tree, growing not in forests but around homes. The house of Kamehameha I at Waikiki was surrounded by them. In Tahiti the *milo* was said to be the shadow of the god of prayer and chanting; hence it was always planted around the temples. In Hawaii the beautifully grained wood was made into calabashes for poi but was not so popular as *kou* for that purpose. The trunk attains a maximum diameter of about two feet, its branches, which spread widely in a horizontal direction, here and there grow as high as 40 feet. The bark is thick and corrugated, the twigs scaly, the leaves glossy, round and pointed or heart shaped. The bell-shaped flowers are pale-yellow except at the base, where they are purple, and they wither to a purplish-pink during the day. They blossom most of the year. Among them can usually be found

round, woody seed cases, each about an inch in diameter, which ripen only in dry regions.—Corner of Kinau and Piikoi streets on school grounds; Thomas Square.

Leaves.—Roundish and pointed or heart shaped, 3-5 inches in diameter, smooth, glossy, undulate, palmately 7-veined, more or less covered on both sides with scales, glandular pore between bases of veins beneath; stem 1-3 inches long. *Flowers*.—Pale-yellow except inside at base of each petal, where they are purple, withering to purplish-pink; bell-shaped, axillary, 2-3 inches in diameter, solitary; stem 1-1 1/2 inches long. *Calyx*.—Truncate, faintly 5-toothed, cup shaped, 1/2 inch long. *Corolla*.—Petals 5, 2 inches long. *Stamens*.—In a column dividing into 5 parts. *Fruit*.—Capsule round, somewhat lobed, woody, 1 inch in diameter, opening late; seed obovoid 1/3 inch long, hairy at base and angles, compressed; persistent calyx at base, more or less scaly. *Home*.—Eastern Tropics and islands of Pacific.

Cotton plant, sea island cotton (*Gossypium barbadense* Linnaeus). Figure 43, *b*.—The cotton plant of southern United States is grown in several places in Honolulu for ornamental purposes. It thrives in low-lying coastal regions. Attempts have been made to raise cotton in Hawaii, but unsuccessfully due to harm from the bollworm and the tendency of the plant to grow to a large perennial. Some time after the yellow, purple-tinged petals have fallen, an oval, leathery seed case is ripe that contains black seeds wrapped in



FIGURE 43.—Mallow family: *a*, mulo (*Thespesia populnea*), leaf and seed cases; *b*, cotton plant (*Gossypium barbadense*), leaves, green and ripe seed cases.

a mass of white cotton—the boll. The cotton plant is a spreading shrub four to eight feet high, whitened with woolly hairs. The bluish-green, heart-shaped and lobed leaves are hairy on both sides and are faintly speckled with black dots. Besides the use of the cotton for fiber, a valuable oil is yielded by the seeds, from the residue of which comes material for fertilizing and for food for stock.—Corner of Alexander and Bingham streets.

A Philippine legend tells of a mother taking one of her twin babies to the cotton field with her. While she was spreading out cotton fiber for him to lie upon, a wind picked up the cotton, wrapped it round the baby and carried him to a far place, where he grew into a great warrior. The other twin also became a great warrior. They became jealous over a woman, and the rivalry was only settled when they found out that they were brothers.

In the Punjaub, India, when the first cotton bursts open the largest boll is bound up, is saluted as "Mother Cotton," and is prayed to in the hope that all the cotton may grow as profusely. In Mexican mythology it is said that at one time cotton grew in all colors so that it was not necessary for people to dye it. Herodotus in writing of cotton in India stated, "Certain wild trees there bear wool instead of fruit, that in beauty and quality excels that of the sheep; and the Indians make their clothing from these trees."

Hawaii has its native cotton plant, called *mao* (*G. tomentosum*)—a shrubby weed along the shore, the seeds of which are wrapped in a brownish wool.

Leaves.—Smooth or nearly so, indented at base, 3 or 5-lobed, lobes pointed, 3-5 inches long. *Flowers*.—Resembling hibiscus. *Calyx*.—Truncate or shortly 5-cleft. *Corolla*.—Petals pale-yellow, tinged with purple, 2 inches long. *Stamens*.—Column naked at apex. *Pistil*.—Style undivided, club-shaped, 3-5 grooved. *Fruit*.—Capsule, loculicidal; seeds black, woolly with long, white silky hairs, easily separable. *Home*.—Mexico to Brazil (Von Mueller); tropical regions (Kew Index).

COTTON-TREE FAMILY

(Bombacaceae)

Baobab tree, bottle tree, monkey bread tree, sour gourd (*Adansonia digitata* Linnaeus). Figure 44.—Though never exceeding 60 feet in height, the peculiar-looking baobab is one of the largest trees in the world. It is also one of the longest lived. Where at

home on the grassy plains of tropical Africa several large trees are living that are reckoned as about 5,000 years old. The trunks are largest at the base and taper to the top, one especially large tree (on Mannar Island) having a greatest circumference of 62 feet and a height of only 30 feet. Adaptation to a dry climate has caused the development of a deep root system and a fleshy trunk with little wood and large water-storage spaces.



FIGURE 44.—Cotton-tree family: baobab tree (*Adansonia digitata*), young tree after shedding leaves.

A light-gray bark, which bears small round bumps and horizontal wrinkles, yields not only a white gum and mucilage but also a good fiber for rope, paper, and coarse cloth. The branches are large and many nearly vertical and only in the wet season bear leaves, which are three to seven-fingered. Both mucilage and cattle fodder are furnished by the foliage. Hanging by long thick stems, large white flowers appear in the wet season at home. From them develops a long woody fruit containing a mealy acid-tasting pulp, eaten both by people (in Ceylon with buffalo milk and sugar) and cattle. As the pulp contains about 30 seeds the fruit is sometimes called "Judas' bag."—Grounds of Queen's Hospital; park corner of King and Keeaumoku streets.

Negroes in Senegambia worship these trees, and in several parts of Africa they often use the old, hollow trunks as houses, prisons, and even council halls. As poets, buffoons, and musicians are

thought to be possessed of devils, the natives bury them in the hollow trees, for they believe that such bodies would destroy fruit and fish if allowed to pollute earth and sea. Valued reservoirs of water, filled during the rainy season, are contained in some trees.

Leaves.—Deciduous, palmately compound; leaflets broadly oblong, pointed, smooth; 5-7 fingered, 3 if young. *Flowers*.—About 6 inches in diameter, on long thick stems. *Calyx*.—Persisting, 5-lobed. *Corolla*.—Petals white, obovate, 5. *Stamens*.—A round crowded mass with purplish anthers, on a thick pedestal. *Fruit*.—Sausage or gourd shaped, 12 by 4 inches, woody, indehiscent, filled with mealy pulp, mucilaginous; seeds many, brown. *Home*.—Tropical Africa, possibly India also.

Bombax (*Bombax ellipticum* Von Humboldt, Bonpland, Kunth).—Because of its few branches and long period of bareness the bombax is far from attractive. It has green or gray, smooth bark, which yields a medicine good for hardening the gums and for curing toothache. In South America it becomes a rather tall tree. In Honolulu the only three known are still young and small. Of especial interest are the large, handsome flowers, which Mexicans consider one of their most beautiful kinds. They appear gradually during January and February in leaf axils before the new leaves. The long cylindrical buds are said to open with a slight explosive sound, when the five long petals, purple outside and downy-white within, curl back and expose numerous long pink or white stamens. Many small seeds, surrounded with cotton, are produced in each of the leathery capsules.—Grounds of Queen's Hospital; Capitol grounds.

Leaves.—Deciduous, compound; 5, stalked, oval or elliptic leaflets, 4-9 inches long, thin, tips rounded, veins prominent on under side, slightly woolly when young; main stem nearly a foot long. *Flowers*.—Large, handsome axillary, on 1-flowered stem. *Calyx*.—Truncate, 1/2 inch long, ordinarily with 10 glands at base. *Corolla*.—Petals; purplish outside, downy and white within, oblong-linear, 5, distinct, 3-5 1/2 inches long, curling backwards. *Stamens*.—Numerous, pink or white, filaments long. *Fruit*.—Capsule, leathery, oblong, ellipsoid, 4 inches long, 5-celled, densely woolly within; seeds numerous, small, imbedded in dense cottony dirty-white wool. *Home*.—South America.

Silk cotton tree, kapok [*Ceiba pentandra* (Linnaeus) Gaertner].—The fast-growing silk cotton tree, known in tropical America, Africa, and Asia, is tall (40 feet or so) and has many close relatives that are both tall and large. When the smooth, five to seven-fingered leaves drop, as they do annually, the characteristic branching, at right angles to the trunk, can be seen distinctly. The

gray or green bark is covered with conical spines. The flowers are dirty-white or pinkish and appear just before the new leaves. In May, about two months after the flowers have fallen, the cottony content of the capsules surrounding the brown seeds is a common sight in the neighborhood of this tree.

A great variety of uses is served by different parts of the tree, which is valuable for its shade, as in market places in Mexico, around temples in India. The buttresses, which are present at the base of some trees, are used for house doors by natives of Mexico. The bark furnishes a red fiber for ropes and paper in India, also a medicine for wounds and some internal disorders. The wood is white and soft and good for canoes, packing boxes, matches. In some countries the leaves and young fruits are cooked and eaten. The seeds yield an oil burned for lights and used in soap manufacture, and both seeds and flowers are eaten by stock. The most important product is the white floss around the seeds, being used as stuffing for mattresses, pillows, life preservers, upholstery, and in England for beaver hats; the largest supply comes from Java and the Philippines.—Capitol grounds; 687 Iolani Street; park corner of King and Keeaumoku streets.

According to Mexican myth the Chiapanecas sprang from the roots of the silk cotton tree, which in Africa is sacred to two deities and can be cut only after certain ceremonies. According to a legend of the Guiana tribes of South America, the creator formed all things from a silk-cotton tree, except the white man who sprang from the chips of a worthless tree.

Leaves.—Digitate; leaflets 5-7, pointed, 3-8 inches long, smooth. *Flowers*.—Dirty-white or pink, 1 inch long. *Calyx*.—About $\frac{2}{5}$ of an inch long. *Corolla*.—Petals silky-hairy outside. *Stamens*.—In a column with 5 branches, each having 2 anthers. *Fruit*.—Elliptic capsule, 4 inches long, filled with white floss surrounding 100-150 round, brown seeds. *Home*.—Tropical Asia and Africa.

COCOA FAMILY

(Sterculiaceae)

Dombeya (*Dombeya spectabilis* Bojer).—From tropical Africa has come a large shrub, dombeya, which is quite popular in Honolulu. The foliage is heavy and furnishes a thick covering composed of large, nearly round leaves with several pointed lobes. The flowers

are crowded in round, dense, drooping, pink heads that continue to hang even after they have faded and turned brown. They are commonest in January. Each flower has five petals and 15 to 20 stamens. —Kamanele Park; grounds of University Club.

Leaves.—Cordate, round, or oblong, pointed, wavy, 5-9 palmately veined, rough above and rusty or whitish downy beneath; stems downy. *Flowers*.—Crowded in much branched axillary and terminal clusters, pinkish, each about $\frac{3}{4}$ inch across. *Calyx*.—Sepals 5, lanceolate; shorter than corolla. *Corolla*.—Petals 5, roundish. *Stamens*.—United only at base, 15-20. *Pistil*.—Stigmas 5. *Fruit*.—Capsule 3-5 celled, opening down the middle of the back of each cell. *Home*.—Eastern tropical Africa.

Kleinhofia (*Kleinhofia hospita* Linnaeus).—Somewhat resembling the dombeya is a rare but conspicuous tree in Honolulu, one of which is growing on the grounds of the Central Union Church. This well-shaped tree is a kleinhofia, and it comes from India. Beginning in July or August, from among the broadly heart-shaped leaves rise beautiful large clusters of small pink flowers, which develop into five-valved seed cases.

Sterculia (*Sterculia urens* Roxburgh). Figure 45, *a*.—Of the two kinds of sterculia growing in Honolulu, one kind is common. It grows well, but has not yet had time to reach the large size found in its native India and Ceylon, where dry, rocky, hilly ground is its favorite soil. This sterculia has few and wide-spreading branches, which bear large and conspicuous leaf scars and thick, blunt twigs. The outer bark is smooth, white or green-gray, and flakes off in long papery scales. The fibrous inner bark is used in India for making ropes. It also yields a gum that is soluble in water and is good for throat troubles.

The tree is not evergreen. The leaves are placed closely at the ends of the branches, and they are large and shallowly lobed. The flowers are greenish, with purple centers, and they make their appearance in crowded clusters before the new leaves appear. But they are not so conspicuous as the leathery seed cases, four or five of which, covered with red stinging hairs, radiate from the end of a long stem. The seeds within are sometimes ground up and used instead of coffee in India.—Thomas Square; Emma Street, opposite Royal School; Armstrong Street between Liloa Rise and Oahu Avenue.

Leaves.—Terminal, shallowly 5-lobed, smooth or slightly downy on top, matted with hairs beneath, 8-12 inches long, rounded, indented at base, closely placed at ends of branches; stems woolly, 8-12 inches long. *Flowers*.—In crowded, erect panicles, small and hairy, greenish with purple center, less than 1/2 inch across, stemmed; sexes ordinarily separate, a few hermaphrodite. *Calyx*.—Segments ovate, acute, tube bell shaped, downy on both sides; in male flowers, staminal column short, anthers about 20. *Fruit*.—Leathery carpels about 3 inches long, radiating at end of a long stem, oblong or curved, covered with red, stinging, stiff hairs; seeds 3-6 in each carpel, dark-brown. *Home*.—India.

Sterculia (*Sterculia foetida* Linnaeus). Figure 45, *a*.—A *Sterculia*, *S. foetida*, is rare in Honolulu. It likes dry, low ground and in many ways resembles the more common *S. urens*. But its leaves are smaller, are deeply lobed to the stem, and when old are smooth. The flowers are larger, red and yellow or purple, and appear with the leaves. They have an odor so disagreeable that carrion flies are attracted to them, and where growing near dwellings are kept picked

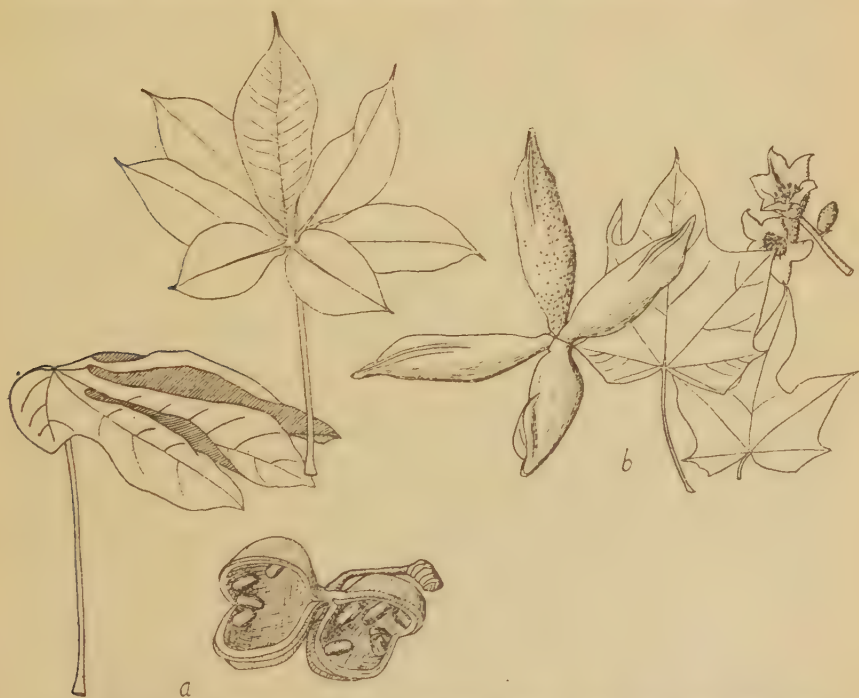


FIGURE 45.—Cocoa family: *a*, *Sterculia foetida*, leaf and fruit, at right; *Sterculia urens*, leaf, at left; *b*, red shower (*Brachychiton discolor*), leaves, flowers, seed cases.

to prevent offense. The striking-looking fruit is larger than that of the other species and consists of scarlet, woody cases that gape when ripe and disclose black seeds. These are oily and in some countries are eaten after being roasted. The Filipinos have an old superstition that prayer and food offered before this tree will relieve a certain disease.—Punahou Park; Moanalua Gardens.

Leaves.—Crowded at ends of branches, 5-7 inches long; consisting of 5-11 elliptical, thick, pointed leaflets; young leaves not smooth, old ones smooth; stems long. *Flowers*.—In erect panicles 6-12 inches long, red and yellow or purple, ill smelling, appearing with the leaves, each flower 1 1/4 inches in diameter, sexes separate on the same tree or not; male: staminal column nearly 1/2 inch long, much curved, anthers 15-20; female: carpels 5, woolly; styles 5, woolly, and curved down, anthers undeveloped. *Calyx*.—Deeply cut into 5 narrow, pointed, spreading, downy segments. *Corolla*.—Petals wanting. *Fruit*.—Follicle, pendulous, scarlet, woody, 1-5, 3 inches or more in diameter, when ripe gaping almost flat, nearly smooth outside, fibrous and smooth inside; seeds 10-15, oily, nearly sessile, about 1 inch long, ovoid-oblong, smooth, black with yellow mark. *Home*.—Tropics of the Old World.

Flame tree, red shower (*Brachychiton acerifolium* F. von Mueller). Figure 45, *b*.—The red shower is a magnificent sight in Honolulu through June and July and sometimes in August, when its rich, dark-red flowers hang in large, loose clusters from the branches at the axils of leaves. Seeds ripen in long-stemmed, black cases. The leaves are also long stemmed; they are large and divided into lobes. A mucilaginous sap that hardens on exposure to air is exuded from the smooth bark. As this exceedingly attractive tree is not only large but evergreen, it is valuable for shade, especially bordering walks.—Park at corner of King and Keeaumoku streets; 2502 Nuuanu Avenue.

Leaves.—With 3-7 distinct lobes, 4-10 inches in diameter, long stemmed, smooth above, whitish with matted hairs beneath. *Flowers*.—Dark-red, in loose, axillary racemes or panicles, in axils of upper leaves. *Calyx*.—Bell shaped, about 1 1/2 inches long, red, downy inside and outside, divided to middle into broad lobes with margins bent abruptly. *Corolla*.—Petals lacking. *Fruit*.—Follicles, black, woody, pointed, covered with rusty matted hairs, 4-6 inches long, long stemmed. *Home*.—Australia.

MANGOSTEEN FAMILY

(Guttiferae)

Mammee apple (*Mammea americana* Linnaeus). Figure 46, *a*.—The mammee apple is often confused with its relative, the common Hawaiian *kamani*, and with the rare *noronhia*, for they re-

seem one another closely in some ways. The mammee apple can be distinguished by its flowers, which are largest of all and more or less scattered; by its fruit, which is largest; and by its leaves, which have many fine parallel veins connected in a network pattern. The mammee apple is cultivated chiefly in the American Tropics, in Jamaica growing to an elevation of 3,000 feet. It becomes 30 to 60 feet tall and has a heavy crown of shining, leathery, oblong leaves. The fruit is round, brownish, and its sweet, orange pulp is eaten raw or preserved. New plants grow easily from the seeds. In America several uses are made of the tree. An astringent is prepared from the bark, a liquor from the flowers. The juice or gum has the power of removing insects and worms from the flesh of animals. As the wood is beautiful, strong, and endures dampness, it is used in buildings, also for posts and piles.—Near entrance to Academy of Arts.

Leaves.—Rigid, leathery, 4-8 inches long, obovate-oblong, rounded at tip. *Flowers*.—In axillary clusters of 1 or more. *Calyx*.—Two-parted. *Corolla*.—Petals 4-6, white, fragrant. *Stamens*.—Many, anthers oblong, opening laterally. *Pistil*.—Ovary 2-4 celled, stigma peltate or broadly lobed. *Fruit*.—Round, brownish, diameter 3-6 inches; pulp orange, juicy, sweet and aromatic tasting; skin bitter and resinous; seeds 1-4, rough, rounded, bitter and resinous. *Home*.—Tropical America.

True kamani (*Calophyllum inophyllum* Linnaeus). Figure 46, *b*.—A native of the eastern Tropics, the true *kamani*, grows near the sea. Several are scattered through Honolulu, and some border a piece of the road running beside Kaneohe Bay, on windward Oahu. It is a tall, handsome, smooth-barked tree, which in flowering time generously spreads fragrance in its neighborhood from snowy clusters of many small flowers. The large and attractive leaves are shiny and leathery. The fruit is round and reddish and clustered. A thin leathery skin covers a bony shell, and this encloses a kernel surrounded with cork. "Punnai nut" is the commercial name for the seed, from which a thick, dark-green oil is extracted. This has medicinal properties and is also burned for lights. Fijians use it for greasing their bodies. Not only the seeds but the wood, which is hard and tough, is much used in commerce, in some tropical parts of the world, at least.

The *kamani* is mentioned in old chants of Hawaii, and a grove of it was noted on Molokai by early navigators. In many parts of Polynesia the *kamani* was a sacred tree, corresponding to the oaks

of the Druids, and it was much planted around temples.—Park at corner of King and Keeaumoku streets; School Street near Fort Street; grounds of University of Hawaii.

Leaves.—Ovate or obovate, shining, leathery, smooth, 4-8 inches long, tip pointed or notched, fine parallel veins; stem large, flat, $1/4$ - $3/4$ inch long. *Flowers*.—White, small, fragrant, many in stalked, short, loose, axillary racemes, 2-6 inches long; stems stout, smooth, short, one-flowered, ordinarily opposite, 1 inch long. *Calyx*.—Sepals oval, obtuse, concave, reflexed, 4, 2 inner longer. *Corolla*.—Petals 4, oblong, obtuse, spreading, $1/2$ inch long, white. *Stamens*.—Many; filaments spreading, joined at base in 4 or 6 bundles. *Fruit*.—Clustered, reddish, round, smooth skin covering bony shell, containing cork-surrounded oily kernel 1 inch long. *Home*.—Eastern Tropics.



FIGURE 46.—Mangosteen family: *a*, mammee apple (*Mammea americana*), leaf, flower at left, young fruit at right; *b*, true *kamani* (*Calophyllum inophyllum*), leaf and flowers; *c*, garcinia (*Garcinia xanthochymus*), leaves and fruit.

Garcinia (*Garcinia xanthochymus* Hooker). Figure 46, c.—The garcinia is a handsome bushy, medium-sized tree, pyramidal in shape, that resembles its relative, the mangosteen (famous for bearing one of the most delicious fruits known). Another relative, the gamboge tree, yields a pigment. The fruit of the garcinia, yellow, smooth, and thin skinned, is round except for a spur near the tip. It is edible, having yellow, juicy, sour pulp, enclosing a large seed, and ripens in October and November. The leaves are shiny, leathery, narrowly oval, and pointed at the tip. From the bark is obtained a yellow dye.—Grounds of Kapiolani Maternity Home, Bere-tania Street.

Leaves.—Shiny-green, narrowly ovate, leathery, pointed, a foot long. *Flowers*.—In leaf axils, with four petals, polygamously dioecious. *Fruit*.—Yellow, 3 inches in diameter, skin smooth and thin, round except for a spur near tip; pulp yellow, sour, juicy; seed large, filling most of interior. *Home*.—India, Malaysia.

TAMARIX FAMILY

(Tamaricaceae)

Tamarix (*Tamarix* species). Plate XXVI.—An ornamental tree, the tamarix, with tiny, scalelike leaves that give a feathery appearance to the branches, is not common in Honolulu, but many slips have been planted on Molokai. One in Honolulu is growing by the Scottish Rite cathedral, others on the Fair grounds. About 60 different kinds are known in dry, warm places from the Mediterranean to Japan. They grow well in salty or alkaline or sandy soils, and they serve well to bind loose soils. In large open clusters the many small flowers form. When the tree is in full bloom it appears to be covered with a white veil. Minute, hairy-tipped seeds developed in small capsules, which open in three to five parts.

ARNOTTO FAMILY

(Bixaceae)

Arnotto (annotto), kealia, dye plant, rocou (*Bixa orellana* Linnaeus). Figure 47.—Part of the berry—the orange-red pulp covering the seeds of the annotto dye plant—is the cause of its extensive cultivation. Originating in tropical America it has been raised both in the West Indies and East Indies and also in Ceylon, and from

South America as many as 80 tons of seeds are imported yearly both by England and the United States. The dye from the fruit is the coloring matter chiefly used in dairy products, butter and cheese, somewhat in silks and also in preparing chocolate. Formerly in Mexico a prized beverage was prepared by cooking cacao beans with vanilla, sugar, cinnamon, annatto seeds, and some kinds of dried flowers. The nickname "lipstick plant" divulges a popular and extensive use. The plant has many other uses: the bark furnishes a fiber for cordage, the stems a gum like gum arabic; in South America, Indians obtained fire by friction from the white, soft wood; and in Brazil bulls are fed the seeds, the pulp of which makes them active and dangerous for the bull ring.



FIGURE 47.—Arnotto family: arnotto dye plant (*Bixa orellana*), leaf, flower, seed cases.

The plant is a tree that may reach a height of 30 feet, and it bears heart-shaped leaves. Pretty pinkish or white flowers make a considerable showing in clusters at the ends of the branches, which soon become clusters of round or oval, brown or dark-crimson capsules covered with fleshy bristles.—Corner of University and Metcalf streets; garden on East Manoa Road, between Beckwith and Armstrong streets.

Leaves.—Heart-shaped, entire, alternate, 3-8 inches long, minutely scaly beneath, petioles long. *Flowers*.—Pinkish or white, in terminal panicles, perfect. *Calyx*.—Sepals 5, overlapping, deciduous. *Corolla*.—Up to an inch long, petals 5. *Fruit*.—Capsule, round or oval, 1 inch long, mostly covered with long fleshy spines, in large terminal clusters, brown or dark-crimson; seeds many, with fleshy orange or red covering. *Home*.—Tropical America.

PASSION-FLOWER FAMILY

(Passifloraceae)

Granadilla (*Passiflora quadrangularis* Linnaeus). Figure 48, *b*.—The granadilla is one of the commonest kinds of passion vine cultivated. In Honolulu it is raised for the sake of its fruit, which is edible. It is a strong vine and climbs high. Just above the tendrils, scattered along the smooth stem, are situated the purple-stemmed, oval leaves. From the bases of the leaves fragrant flowers raise their interesting heads. These are reddish or purple and bear a large crown of white and purple filaments. The oblong, yellowish fruit grows as large as a papaya, and it contains a pleasant, slightly acid-flavored pulp and many seeds. It can be pollinated either by bees or by hand.—United States Experiment Station, Pensacola Street.

In the old days, Spanish and Italian travelers in tropical America marveled at this strange flower, possibly not this particular kind, as other kinds have as conspicuous flowers. They gave it the name "passion flower," as it suggested to them the passion or suffering of Christ: the ten equal colored parts of the flower representing the ten apostles at the crucifixion, the showy crown representing the crown of thorns or halo, the five stamens the five wounds, the tendrils the cords or scourges, the leaves the hands of the persecutors, the three styles the three nails, the white color purity, the blue heaven. It is said to remain open three days, thus symbolizing the three-years' ministry.

Leaves.—Broadly ovate, entire, short pointed, indented at base; stems purplish, bearing 2-4 pairs of glands. *Flowers*.—Round, 3-5 inches in diameter, axillary, fragrant, crown composed of 5 series of white and purple filaments, the outermost exceeding the 10 colored parts of the floral envelope. *Calyx*.—Sepals 5, ovate, purple. *Corolla*.—Petals 5, ovate, lilac. *Stamens*.—Five. *Pistil*.—Styles 3, stigmas 3, with rounded heads. *Fruit*.—Oblong, 5-9 inches long, pale yellowish-green; covered with a shell; pulp pleasant tasting, slightly acid, space within triangular in cross section; seeds many, flat. *Home*.—Tropical America.

Passion vine (*Passiflora alata* Dryand).—A passion vine that climbs vigorously on arbors and trellises in a few places in Honolulu bears one of the most edible kinds of passion fruit. It resembles somewhat the yellow water lemon. Its dull-orange, oval, rather soft shell encloses a juicy, pleasant-tasting pulp. The vine has winged stems and long, oval leaves. The flowers are fragrant and are colored red, purple, white.—United States Experiment Station, Pensacola Street.

Leaves.—Long, ovate pointed, smooth, indented at base, margins wavy; stems rather short and bearing 2 glands. *Flowers*.—Purple, fragrant, 2-4 inches in diameter, axillary; corona about as long as the envelopes, the many filaments parti-colored with red, purple, white; interior of sepals (5) and petals (5) carmine. *Fruit*.—Oval, pointed, yellow, 3-5 inches long, very fragrant; shell leathery, smooth, when green having 6 white striations, dull-orange when ripe; pulp fragrant, juicy, edible; seeds many. *Home*.—Peru and Brazil.

Yellow water lemon, Jamaica honeysuckle, lemiwai, liliwai (*Passiflora laurifolia* Linnaeus).—Tropical America has contributed the yellow water lemon to Hawaiian gardens, and it is so well adapted to the climate that it grows wild, especially along the north-east coast of the island of Hawaii in Hamakua and also in Hilo. The leaves are thick and resemble in shape those of the granadilla, but are deeper lobed at the base. The flowers, white with red spots, bear a large crown with white and violet filaments. The fruit is yellow with white spots and contains in a hard shell a yellowish, edible pulp and many black seeds. In markets in Honolulu the yellow water lemon is on sale part of the year.—United States Experiment Station, Pensacola Street.

Leaves.—Ovate heart shaped, tip short pointed, thick, entire, like *P. quadrangularis* but deeper lobed at base; stem with 2 glands. *Flowers*.—White with red spots, 2 1/2 inches in diameter, axillary; corona somewhat exceeding petals or equalling them, in 3 series, white bands on violet. *Fruit*.—Smooth, shining, yellow with white spots, slightly oblong, 3 by 2 inches; shell rather hard; pulp edible, whitish-yellow, containing many black, flat seeds. *Home*.—Tropical America.

Purple water lemon, sweet cup, lilikoi (*Passiflora edulis* Sims).—While practically confined to gardens on Oahu, the purple water lemon grows rank and wild in forests on Kauai. In most other tropical countries also, this strong, woody vine is naturalized. White flowers tinted with purple spring from the axils of three-lobed

leaves. The juicy orange pulp contained in the brittle-shelled, purple fruit is fragrant and edible and affords gratifying refreshment to a thirsty walker.—United States Experiment Station, Pensacola Street.

Leaves.—Large, deeply and nearly equally 3-lobed, margins toothed, tips pointed; stem short. *Flowers*.—White tinted with purple, axillary; rays nearly as long as floral envelopes, upper half white, base purple. *Fruit*.—Round to oblong, smooth, shining, when ripe thickly dotted with purple; outer covering a hard, brittle shell, lined with a white pulp; large space within crowded with seeds covered with a juicy, orange, fragrant, edible pulp. *Home*.—Brazil.

Passion vine (*Passiflora foetida* Linnaeus). Figure 48, *a*.—One of the passion vines is a strong climber that lives a year or longer and grows well on arbors and trellises. Helping to support it are tendrils coming from the base of the three-lobed leaves. The fruit is bright-red, nearly round, and is enclosed in lacy floral parts. It is not edible. The flowers are the chief attraction. They are white with a purple and blue crown.—Y. W. C. A. Beach Club House; on roadsides.

Leaves.—Three-lobed, the central lobe longest, margins entire or obscurely angled, hairy; stems rather long. *Flowers*.—Small, white; crown purple and blue. *Calyx*.—Sepals 5, lacelike. *Corolla*.—Petals 5, white, as long as crown. *Stamens*.—5. *Pistil*.—Styles 3, stigmas 3, with rounded heads. *Fruit*.—Bright-red, rounded triangular, flat at base, round pointed at tip, 3/4 inch in diameter, enclosed in lacy sepals. *Home*.—Brazil.

Passion flower (*Tacsonia vitifolia* Von Humboldt, Bonpland, Kunth). Figure 48, *c*.—Though rather rare for awhile in Honolulu a vigorous, highly ornamental passion vine from South America with gorgeous flowers is becoming commoner as it is becoming better known. The flowers are bright-red and large, and they arise in the axils of the leaves, which are dark-green and mostly three-lobed.—In a few gardens.

Leaves.—Becoming leathery and smooth (woolly when young), most deeply 3-lobed, some with two small basal lobes, indented at base, largest 6-7 inches in diameter; lobes ovate-oblong, pointed, coarsely toothed; with stems. *Flowers*.—Peduncles shorter than leaves, growing from leaf axils with solitary, unbranched tendrils, 5-6 inches in diameter, red; bracteoles 3, colored, veined, about 1 inch long, forming involucre close under flower. *Calyx*.—Tubular (not so in *Passiflora*), sepals 5, similar to petals except for small, green, dorsal horn just below the tip, tube about 1/2 inch across and deep, 10-furrowed. *Corolla*.—Petals 5, oblong-lanceolate; 3 coronas, outer corona threadlike, in 3 series, 1 free, crimson, half as long as petals, 2d series free and shorter than first, 3d series white and tubular to above middle and longer than 2d; middle

corona thin, showing near top of tube, fringed at top; inner corona small, toothed scales. *Gynandrophore* (bearing stamens and ovary).—About 2 inches long, green spotted with crimson; stamens 5, anthers green; ovary smooth, green, styles short, crimson; stigmas large, round, compressed. *Fruit*.—Unknown. *Home*.—Panama.

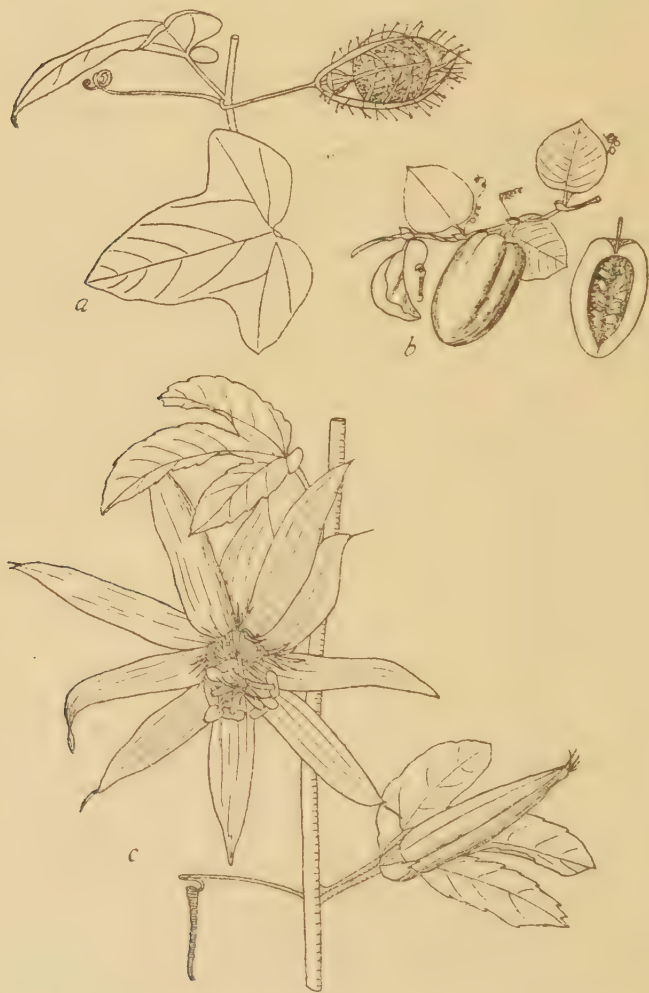


FIGURE 48.—Passion-flower family: *a*, passion vine (*Passiflora foetida*), leaves and fruit; *b*, granadilla (*Passiflora quadrangularis*), leaves and fruit; *c*, tacsonia (*Tacsonia vitifolia*), leaves, flower, bud.

CARICA FAMILY

(Caricaceae)

Papaya, pawpaw, mikana, hei (*Carica papaya* Linnaeus). Figure 49.—The papaya is a favorite fruit in Hawaii, where it grows easily and quickly from seeds both in orchards and gardens up to an elevation of 1,200 feet. It ranks with pineapples and bananas in abundance of production. In 1848 the papaya was introduced to Hawaii and was probably planted first at Hanalei, Kauai. The trees are small, some about 20 feet high, and they do not ordinarily branch. The trunks are gradually tapering, are hollow within, and have a light-colored bark, which contains milky juice and is nearly smooth except for regular heart-shaped scars. Ropes can be manufactured from the bark fiber. The huge, broad leaves, which are deeply cleft and much subdivided, are clustered at the top of the trunk on long, hollow stems, and directly at their base flowers and fruit are borne. A tree should begin to bear a year after being set out, and though the best crops are produced during three or four years, trees have been known to bear for 15 years. During winter fruit ripens slowly, and so the supply is then smallest.



FIGURE 49.—Carica family: papaya (*Carica papaya*), two-year-old tree.

In nature of flowers the trees vary considerably, 13 different kinds having been noted. One kind produces only fruit-bearing flowers, a second kind only pollen-bearing, a third both fruit and

pollen-bearing, a fourth all three kinds. These forms are not constant except the fruit-bearing, some pollen-bearing trees changing to fruit-bearing after being cut off at the top. Fruit develops from some pollen-bearing flowers, and it is of excellent quality. The fruit varies in shape and size, large papayas weighing about eight pounds. Some pollinated and some unpollinated fruit develops without seeds. The fruit is eaten raw, sometimes with lemon juice or ketchup, baked like squash, stewed, cooked with other fruits in jam. The milky juice so evident in the fruit contains papain, an active protein-digestive principle. It comes from juice tapped from green fruits and dried and is used medicinally in powder form for skin diseases in Europe and the United States. Probably Ceylon and the West Indies supply most of this product. The juice has other uses. Leaves are sometimes wrapped around fresh meat over night to make it tender, and leaves and green fruit are rubbed over meat for the same purpose. They are also used as soap to remove stains from cloth. Other uses of the fruit are as a vermifuge and a cosmetic.—Orchards here and there along road between Kaimuki and Koko Head.

Leaves.—Clustered at top of trunk, palmately 7-lobed, the large, various-shaped lobes regularly subdivided and pointed, soft, smooth, alternate, some 2 feet across, milky juice; stems long, hollow. *Flowers*.—Ordinarily male and female on different trees, some hermaphrodite; male: in several clusters on a long branching stem, white or cream, many, fragrant, smaller than female, narrow, tubular, spreading out in 5 lobes, 10 anthers on the tube; female: yellowish-white, solitary or 2-3 together in leaf axils on short stems, fragrant, 5 petals, no stamens, 1 pistil with 5-rayed stigma. *Fruit*.—Yellow or green and yellow, varying in quality, in shape from long-ovate to rounded, 6-12 inches long, short stemmed; skin thin; pulp white to orange to red, sweet, juicy, pleasant tasting, exuding a milk; central space lined ordinarily with small hard seeds covered with a glistening black skin and gelatinous coat. *Home*.—Brazil.

CACTUS FAMILY

(Cactaceae)

Cactus (*Cereus peruvianus*?). See page 310.

Night-blooming cereus [*Hylocereus undatus* (Haworth) Britton and Rose]. Plate XXVII.—A climbing cactus is one of the most interesting plants in Honolulu. The quarter-mile hedge on the Wilder Avenue side of Punahou campus is widely known.

The fleshy, green, jointed stems have three wings with scalloped margins, which bear thorns, and have aerial roots growing from the



PLATE XXVI TAMARIX.



PLATE XXVII. NIGHT-BLOOMING CEREUS (HYLOCEREUS UNDA'TUS), PHOTOGRAPH BY A. R. WADSWORTH.

under side. The fruit, rare in Honolulu and common in Mexico, is rounded, red, and fleshy and contains a pulp refreshing to eat. The flowers are far from rare. Early in the evening they open out into beautiful large cups, some as long as a foot and nearly as wide, having a somewhat spicy odor. The many narrow, white, delicate petals surround a mass of long yellow-tipped stamens, a wonderfully beautiful creation, which lasts, unfortunately, not later than noon of the day following their opening. On Manoa hill, the time of flowering of the Punahou hedge was observed for three years, and it was found that during the first week in June the first flowers of the year appeared, at the end of October or first of November the last flowers. Between times, at irregular intervals, three to five big displays and many smaller ones occurred.

About 1830 the first night-blooming cereus was brought to Honolulu on the brig *Ivanhoe* when Captain Charles Brewer was first officer. At a port in Mexico the cereus had been taken on board with other plants, many of which had died during the trip, and when they were to be thrown away Brewer rescued the night-blooming cereus, which still had some life. He tended it, and took it ashore at Honolulu, where it and its descendants have thrived ever since.—On Punahou wall.

Stems.—Functioning as leaves; green, fleshy, jointed, 3-winged, margins scalloped and bearing thorns mixed with wool; aerial roots on under side of stem. *Flowers*.—Nocturnal, white, cup-shaped, some a foot long and nearly as wide; stems thick, bearing fleshy, leaflike scales. *Calyx*.—Like petals, but thicker, fewer, green. *Corolla*.—Petals many, long, narrow, white, delicate. *Stamens*.—Numerous; filaments long, slender, white; anthers yellow. *Fruit*.—Elliptical, red, 3 1/2 by 2 inches, covered with large, red, fleshy scales; pulp inside edible and refreshing. *Home*.—Mexico.

Rope cactus, snake cactus [*Selenicereus grandiflorus* (Linnaeus) Britton and Rose].—Climbing on trees and walls in Honolulu, as at 622 Judd Street, are some examples of a night-blooming cereus with green, roundish stems, an inch or so in diameter, bearing about seven ribs. Needle-like, brown or gray spines less than half an inch long, mixed with white hairs, dot the ribs. The flowers are much like those of the common night-blooming cereus. They are about seven inches long, pinkish outside, white within. In tropical America this cactus grows wild and is used somewhat medicinally as a heart tonic.

Cactus, prickly pear, panini (*Opuntia tuna* Miller). Figure 50.
—The common cactus is a coarse green plant with a height when full grown of 12 feet. Its fleshy, flattened, round or oblong branches, which function as leaves, are generously dotted with bunches of strong yellow spines. The stems of old plants are woody. In dry

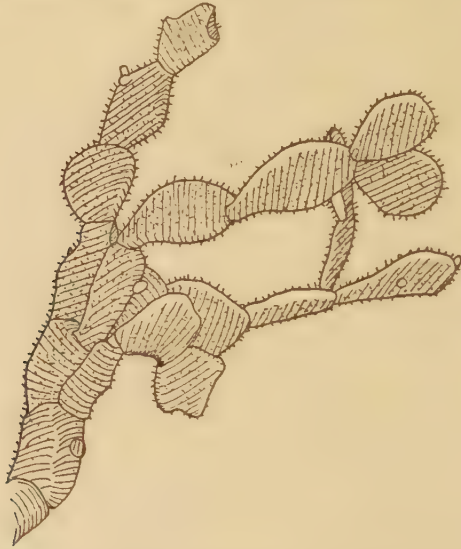


FIGURE 50.—Cactus family: cactus (*Opuntia tuna*).

weather, the branches are eaten by cattle, as are also the purple-red oval or pear-shaped fruits, which are as attractive a feature as the red and yellow, cup-shaped flowers. From America this plant has spread to many countries, where it has proved useful for its fruit, the stems for forage, and the whole plant for hedges. Though in many places where it has escaped from cultivation it is a troublesome weed. *Opuntia* is the name of a town in Greece, where, it is said, a cactus-like plant grew.—Near top of Manoa hill; near Salt Lake.

According to tradition the Aztecs were fleeing from an oppressive tribe about 1325 A. D., when they saw perched on a prickly pear (probably a species of *Opuntia*) an eagle strangling a serpent. The priests seem to have interpreted this as a strangling of their enemies, and upon the advice of the priests the people settled there. Thus was the site of the City of Mexico chosen. On

the arms, flag, and silver dollar of the Mexican Republic are represented an eagle holding a serpent in his beak and standing on a cactus. Many of their ancient altars have carvings of cactus thorns, the Mexicans apparently believing that piercing the tongue with the thorn strengthened their prayers.

Stems.—Functioning as leaves; green, round or oblong, dotted with bunches of strong yellow spines an inch long or more and mixed with whitish wool. *Flowers*.—Yellow fading to red, 3-4 inches wide. *Fruit*.—Purple-red, oval or pear-shaped, 1-1 1/2 inches in diameter, tip flattened, with many fine bristles, thick-skinned; pulp sweet, purple-red, juicy, many-seeded. *Home*.—West Indies and Mexico (Bailey), South America (Kew Index).

Cactus, pereskia (*Pereskia bleo* DeCandolle).—A tropical American cactus rarely seen in Honolulu is highly ornamental, for it bears at the ends of branches clusters of attractive rose-colored flowers. These open out to a diameter of an inch or two, like a wild rose with a dozen petals. The long branches are generously supplied with straight, sharp, black needles an inch long. Strangely for a cactus, the branches also bear leaves, about six inches in length, nearly oblong in shape. The fruit is said to be two inches long, yellow, pear shaped.—Hillebrand Gardens.

Crab cactus, Christmas cactus, ringent-flowered cactus [*Zygocactus truncatus* (Haworth) Schumann].—By its stems branching many times in pairs and by its flat short joints the crab cactus can be identified here and there in Honolulu. At home it associates with orchids and forms drooping bunches on trees. It is popular cultivated in hanging baskets and on rafters in many countries, having been cultivated first about 1818 in England. The joints are dark and shining-green and have coarsely toothed margins. The flowers are very decorative, being bright and abundant. They are tubular in shape and vary in color, from entirely red to white edged with red or purple. They blossom in December in England, hence the name "Christmas cactus." Many varieties are cultivated and many hybrids, resulting from crossing with closely related species of other cacti, such as *Phyllocactus*.—In a few gardens.

Stems.—Functioning as leaves; much branched in pairs, flat, hanging in large bunches; joints 1-2 inches long, about 3/4 inch wide, dark glossy green, margins coarsely toothed, with 1-3 large acute teeth at apex; areolae bearing a few short yellow or dark-colored bristles or none. *Flowers*.—Terminal, growing from truncated end of young joints, markedly irregular, tube (3/4 inch long) bent abruptly just above ovary and ending in a toothed mouth,

2 1/2-3 1/2 inches long, inner floral parts red or white edged with rose or purple, segments oblong and reflexed and blunt or sharp. *Stamens*.—In 2 clusters, outer one borne along inside of floral tube to near middle, inner one composed of about 20 stamens forming a short tube about style base, all appressed against upper side of flower, filaments white. *Pistil*.—Style purple, slender, as long as stamens; stigma lobes purple, linear, erect, adhering. *Fruit*.—Pear shaped, red, about 1/2 inch in diameter, skin thin; seeds dark-brown, shining. *Home*.—Brazil.

Gooseneck cactus, flor de baile [*Epiphyllum oxypetalum* (DeCandolle) Haworth].—A sturdy cactus about three yards long that branches irregularly and hangs from baskets is a gooseneck cactus. Though the woody main stem is nearly cylindrical the branches are ordinarily flat, some thin, some three-winged. Because of its many showy, large flowers, the plant is cultivated in many tropical countries. A variety of forms result from hybridization. The flowers are red, fragrant, and cup shaped, and they begin to open early in the evening, expanding for about four hours and after midnight beginning to droop.—In a few gardens.

Stems.—Functioning as leaves: irregularly much branched; branches thin, flat, 4 inches broad, long pointed, deeply notched; areoles small, on margins of branches; spines ordinarily wanting in adults, appearing as slender bristles in young plants. *Flowers*.—About 10 inches long, tube about 5 1/2 inches long (rather stout, red, nearly 1/2 inch thick, with distant, narrow scales nearly 1/2 inch long), fragrant; outer perianth segments narrow, red to amber, 3-4 inches long, inner oblong and white. *Stamens*.—Numerous; filaments white, long. *Pistil*.—Style white, thick, 8 inches long; stigma lobes several, cream-colored, linear, entire. *Fruit*.—Round or oblong, with many bumps or low ridges, red or purple, edible, some insipid, splitting down one side when ripe and showing white or crimson pulp within; seeds black, shining. *Home*.—Mexico.

HENNA FAMILY

(Lythraceae)

Giant crape myrtle [*Lagerstroemia speciosa* (Linnaeus) Persoon].—A tree crape myrtle has beautiful large flowers rising at the ends of branches in pyramidal clusters up to half a yard long. Though ordinarily of medium height, this myrtle grows 60 feet high in its native India, where it furnishes valuable timber. Fortunately it begins to put forth flowers when small and even then makes an attractive display, as can be seen different years in April, May, June, or July bordering the sides of Lisbon Street in Honolulu. The bloom lasts about two weeks on each plant, the avenue about a month. At the end of the season, the leaves fall, as is also

the habit of leaves on the shrub crape myrtle, which bears smaller leaves and capsules than the tree.—Lisbon Street.

Leaves.—Oblong, leathery, opposite, entire. *Flowers*.—In terminal panicles about 1 1/2 feet long, purplish. *Calyx*.—Bell-shaped tube, fleshy, 6 segments shorter than the tube. *Corolla*.—Petals inserted on brim of calyx tube, 6, clawed. *Stamens*.—Very many. *Fruit*.—Capsules, oval, woody, surrounded at base by persistent semiwoody calyx, opening by 6 valves; seeds many, flat, winged at 1 end. *Home*.—Tropical Asia.

Crape myrtle (*Lagerstroemia indica* Linnaeus).—Pink or white fringed flowers in open bunches at the ends of branches generously decorate shrubs of crape myrtle for about three months, from June to August. Later in the year they bear inconspicuous capsules containing winged seeds. This highly ornamental, smooth, brown-barked shrub grows as high as 15 feet and has slender, square stems, bearing stemless leaves that fall annually. From its home in Asia it has traveled far and wide, even to southern United States.—In gardens here and there along Lusitana Street near end of Emma Street car line; grounds of Central Union Church.

Leaves.—Elliptical, oblong, acute, about 2 inches long, deciduous. *Flowers*.—Pinkish or purplish or white, in small terminal, open panicles, many. *Fruit*.—A capsule, 3-6 celled; seeds winged at the top. *Home*.—Tropical Asia.

Henna, tree mignonette (*Lawsonia inermis* Linnaeus).—In India the henna is cultivated for its dye, for its fragrant flowers, and for use as a hedge plant. In Honolulu, where it might make attractive hedges, it is rare. In Africa and India henna grows wild in dry regions, even deserts, especially near the sea. It is also wild in the West Indies. It is a smooth, much branched shrub 10 to 15 feet high, with side branches ending in spiny points. The flowers are yellow or white and grow in pyramidal clusters, and their odor is so pleasing that it is commercialized for perfume. But commercially the most interesting part of the plant is the foliage, for from the small leaves, particularly those near the ground, an orange pigment is obtained that is used for dyeing clothes and staining hands, feet, nails, hair—purposes for which Mohammedans have employed it for centuries.—Kapiolani Park; park corner of King and Keeaumoku streets.

Leaves.—Ovate or lanceolate, pointed or blunt, smooth, an inch long or more, tapering to base, nearly sessile. *Flowers*.—In axillary or terminal pyramidal panicles 10-12 inches long, yellow to white, very fragrant; individuals small, many, less than 1/2 inch long. *Calyx*.—Smooth, short tube; segments 4,

ovate, acute, pinkish. *Corolla*.—Oblong, wavy petals, spreading or bent back, 4. *Stamens*.—Spreading, in 4 pairs. *Fruit*.—Capsule, small, round, 4-celled, opening irregularly, not $\frac{1}{4}$ inch long, supported on persistent calyx, tipped with style. *Home*.—Africa and India (Rock); Orient (Kew Index).

POMEGRANATE FAMILY

(Punicaceae)

Pomegranate (*Punica granatum* Linnaeus).—The scientific name of the pomegranate, *Punica*, was given to that handsome shrub or small tree because it was supposed to have been brought to southern Europe by the Carthaginians ("Punic" being the old name, of Latin derivation, for "Carthaginian"). Its place of origin is variously cited. The shrub is fairly hardy, growing at 6,000 feet in the Himalayas and in the United States as far north as Baltimore. As many shoots come up from the base and as its branches, which are somewhat thorny, are many and slender, the pomegranate makes a good hedge plant. The oblong leaves grow in pairs or clusters and fall at the end of the season. The rich-colored flowers are a showy orange-red, and some non-fruiting varieties with beautiful double flowers are grown for ornament. Not only the flower but the fruit is an attractive feature of the shrub. It is round, and its colors grade from yellow to red. Its juicy, bright-crimson pulp surrounds the many seeds within the shell-like covering, is pleasant tasting, and furnishes a drink given to fever patients. The outside of the fruit is used for dye or ink. The bark is 32 per cent tannin and is used for dyeing Morocco leather yellow. From the root is obtained bark that is used medicinally as an astringent.

A legend tells of Scythia, who was told by diviners that she would wear a crown. She fell in love with Bacchus, who promised her a crown, but he, alas, soon tired of her. The poor girl died of grief, and Bacchus, in a fit of remorse, transformed her into a pomegranate whose calyx resembles a crown. Persian legend tells of Ferhad, the lover of Shereen, who killed himself with an axe. From the haft sprang the first pomegranate tree. In the art of Japan, Kishi Bojin is pictured with a child and a pomegranate. She was said to eat children until Buddha gave her pomegranates to eat. It was the pomegranate that kept Proserpina from returning to earth. Zeus promised her mother that if her daughter had not tasted food she could return, but Proserpina had tasted the pulp of a few seeds of pomegranate and as a result was required

to spend half the year in Pluto's realms. In the art of early Christendom, the pomegranate bursting open and showing the seeds was an emblem of the hope of immortality. The pomegranate is the national emblem of Spain.—Fernhurst; Academy of Arts; 1661 Lusitana Street.

Leaves.—Opposite or clustered, oblong, obtuse, entire, smooth. *Flowers*.—Axillary, solitary or in small clusters, orange-red, 1 inch in diameter. *Calyx*.—Thick, fleshy, tubular, its 5-7 short lobes persisting as in an apple. *Corolla*.—Petals same number as calyx lobes and inserted between them, lanceolate to obovate, wrinkled. *Stamens*.—Many. *Fruit*.—Berry, round, bright-crimson, 3-4 inches in diameter; pulp juicy, acid, pleasant tasting, surrounding many seeds; dwarf form half as large. *Home*.—Eastern subtropical Asia (Rock); southern Europe and Mauritius (Kew Index); southwestern Asia and northern Africa (Von Mueller).

BARRINGTONIA FAMILY (Lecythidaceae)

Barringtonia (*Barringtonia speciosa* Forster).—On some islands of the Pacific the barringtonia, a beautiful, large tree with a round head, forms beach forests. It has gray bark, and its branchlets are large and marked conspicuously with leaf scars. In various countries a narcotic is extracted from the bark and used to stupefy fish, as is also the bitter seed after being grated. The glossy leaves are clustered. The creamy-white flowers grow in bunches from the ends of branches and shed fragrance. Perhaps the strangest feature of the tree is the fruit, which is a large four-sided pyramid, consisting of a light-brown, spongy case containing a seed. As the case is waterproof and buoyant it readily carries its seed on the ocean, which accounts for the presence of the tree in countries bordering the western Pacific and on islands in the Pacific. Natives use the cases as cork for floating fish nets, and in the Moluccas a lamp oil is extracted from the seeds.—Grounds of University Club; Wah Mun School, Kukui Street.

Tahitians claim that the barringtonia sprang from the human heart, for the fruit is heart shaped, and they call the tree "hutu," meaning "heart."

Leaves.—Smooth, glossy on both sides, bright-green, obovate to wedge shaped, 10-12 inches long, crowded, midrib large, stemless. *Flowers*.—Conspicuous, creamy-white, about 7 inches in diameter, 3-4 inches long, on stout stem, in terminal erect racemes, odorous; buds nearly round, pointed. *Calyx*.—Tube 1/2 inch long more or less, bluntly quadrangular, smooth, limb veined and splitting into 2 or 3 concave segments. *Corolla*.—Petals white, 4, slightly joined,

about 2 1/2 inches long, broadly oval, concave. *Stamens*.—Numerous, crimson tipped, brushlike, ring slightly adnate to base of petals; filaments 3-4 inches long, erect, joined at base in a thick tube. *Pistil*.—Style as long as stamens, red at top. *Fruit*.—A 4-sided pyramid about 4 inches high, when dry consisting of a solid, brown-yellow, fibrous, spongy case tipped with persistent calyx lobes, smooth outside, corky case contains 1 oval bitter seed 2 inches long, indehiscent. *Home*.—India, Andaman Islands, Guam, Philippines, Samoa, and other countries bordering the Pacific, but not Hawaii.

MYRTLE FAMILY

(Myrtaceae)

Guava, lemon guava (*Psidium guajava* Linnaeus).—As a low, evergreen tree or shrub 6 to 25 feet high with wide-spreading, square branches and downy twigs, the lemon guava is a common vegetation cover by roads and in waste places in Hawaii, where it was brought by Don Marin. The remarkably smooth, reddish-brown bark scales off here and there in large, thin layers, beneath which the tree is green. The oval, blunt leaves are prominently veined and whitish beneath, and the flowers are white, fragrant, and tasseled. The outside of the fruit resembles a lemon in size, shape, color, though some are brownish-yellow. But the interior is quite different—a solid pink or cream-colored and pleasantly acid pulp, within which is a juicier pulp full of hard seeds. In Hawaii delicious jelly and jam are prepared from it on a commercial scale. Many of the fruits are stung by the Mediterranean fruit fly. Several varieties of guavas can be distinguished by the size and shape of the fruit, and one variety has yellowish or whitish pulp.—By road on Sugarloaf; upper Manoa Valley.

Leaves.—Ovate, blunt, smooth on top, downy and white beneath, main veins prominent beneath, short stemmed. *Flowers*.—White, fragrant, solitary on peduncle or 1-3 together; buds oval, stem 1/2-1 inch long. *Calyx*.—Ovate tube, closed over bud, upper part coming off or splitting. *Corolla*.—Petals about 1/2 inch in diameter, 4 or 5, spreading flat. *Stamens*.—Many, prominent. *Fruit*.—Outside like a lemon; skin thin, aromatic; pulp solid, pink or cream-colored, somewhat juicy, sweet acid, inner pulp packed with small, hard, kidney-shaped seeds. *Home*.—Tropical America.

Strawberry guava, purple guava, Chinese guava (*Psidium cattleianum* Sabine). Figure 51, f.—From Brazil comes one of the hardiest guava bushes, which grows even farther north than San Francisco. It is really a shrubby tree 10 to 20 feet high with smooth, nearly cylindrical branches. The leaves are dark-green

and shiny. Soon after the white, fragrant flowers fall, the purplish-red fruit develops. This is round, fragrant, about an inch in diameter, and has soft, juicy pulp with a delicious strawberry flavor. Raw and in jam and jelly it is eaten.—Tantalus; United States Experiment Station, Pensacola Street.

Leaves.—Opposite, pointed-ovate, small, leathery, dark-green, shiny, veined like a feather. *Flowers*.—White, fragrant; on axillary, opposite, one-flowered peduncles. *Calyx*.—Four to 5 lobed. *Corolla*.—Four or 5 petals. *Fruit*.—Round, about 1 inch in diameter, purplish-red; skin tough with regular, small depressions; pulp soft, juicy, with strawberry-like fragrance and flavor, reddish near the skin and white at center, containing many seeds. *Home*.—Brazil.

Waiawi (*Psidium cattleianum* Sabine var. *lucidum* Hortorum).—Similar in a general way to the strawberry guava is the *waiawi*, the best-looking guava in Hawaii. It is a well-shaped tree with smooth, oval, pointed leaves and good-tasting, rounded, yellow fruit, which is larger than that of the strawberry guava. It is sometimes found growing with the lemon guava.

Allspice, pimento, Jamaica pepper (*Pimenta officinalis* Lindley).—A small tree from the West Indies is called "allspice" as its pleasant spicy berry when picked green and dried seems to have the combined flavors of cinnamon, nutmeg, and cloves. Few trees grow higher than 40 feet. In a hot, dry climate most fruit is yielded, Jamaica, the only country exporting allspice, shipping about ten million pounds a year. When about 20 years old the tree bears heaviest. An oil distilled from the leaves is added to rum to make bay rum. The leaves are oblong and leathery and two to six inches long. Few trees are growing in Honolulu; but those few are conspicuous when in bloom, small white flowers forming large, crowded clusters. Both flower and berry are a quarter of an inch in diameter. One tree is growing at 1338 Kinau Street.

Mountain apple, ohia ai (*Eugenia malaccensis* Linnaeus). Figure 51, *a*.—On many islands of the Pacific lives a eugenia that in Hawaii, at least, prefers moisture to dryness, foresting shady valleys to an elevation of 1,800 feet. In Waimano Gulch and in Sacred Falls Valley (Kaliuwaa), Oahu, attractive groves are accessible. In such places it reaches a height of 50 feet or less; where solitary it is shrublike. The tree is very handsome. Smooth, mottled, gray bark clothes the trunk, and the foliage consists of dark-

green, shiny, oval leaves. In March and April, when flowering, a grove of mountain apples is especially beautiful. Then cerise pompons burst from trunk and branches on short stems. As they fall a bright-red carpet is laid on the ground below.



FIGURE 51.—Myrtle family: a, mountain apple (*Eugenia malaccensis*), leaves and fruit; b, Java plum (*Eugenia jambolana*), leaves and fruit; c, French cherry (*Eugenia uniflora*), leaves, flower, fruit; d, Spanish cherry (*Eugenia brasiliensis*), leaves and fruit; e, lehua (*Metrosideros polymorpha*), leaves and flower cluster; f, strawberry guava (*Psidium cattleianum*), leaves and fruit.

The trees grow rapidly, and when seven or eight years old they begin to bear fruit. A thin, deep-crimson skin covers a crisp, pure-white pulp that tastes slightly sweet, is very refreshing, and encloses a large rounded seed. Some years, from June till early winter this popular fruit can be bought in the market.

Hawaiian tradition tells of early visitors who spoke like chattering birds, who "were acquainted with the banana, the breadfruit, the ohia apples, and the kukui nuts."—Corner of Keeaumoku Street and Wilder Avenue; Lusitana Street near end of Emma Street car line; upper Manoa Valley.

Leaves.—Dark-green, shiny, opposite, long ovate, 6-7 by 2 1/2-3 inches or longer. *Flowers*.—Cerise, like pompons, growing on short stems from trunk and branches; in axillary cymes, about 2 inches long, lowest branches 1/2 inch long and 3-flowered, the middle or terminal branch racemose. *Calyx*.—Lobes 4, rounded; turbinate. *Corolla*.—Petals 4 or 5, red, obovate, 1/4 inch long. *Stamens*.—Red, 3/4 inch long, many, the conspicuous part of the flower. *Fruit*.—Obovate, deep-crimson with light streaks, about 3 inches in diameter, depressed on both ends; skin a thin film; pulp juicy, crisp, pure-white, sweet; seed commonly single, large, round. *Home*.—Tropical Asia, some islands of the Pacific.

Rose apple, jambos (*Eugenia jambos* Linnaeus).—A eugenia that grows well in Hawaii, as high as 2,000 feet, is an evergreen tree up to 30 feet tall. Its leaf resembles that of the oleander, is long and narrow, thick and shiny. From January to April the flowers are in bloom and at times nearly cover the tree with silky, cream-white pompons. The small, oval fruit has white, yellow, or pink-tinged pulp, which is crisp and pleasant to eat and smells like a rose. It is valued for jelly. About two months are needed for the fruit to mature, the season ending in August or September.—2447 Parker Street.

Buddha is sometimes pictured under a rose-apple tree.

Leaves.—Long and narrow, point gradually tapering thick, shiny. *Flowers*.—Many, silky, creamy-white, like pompons. *Calyx*.—Tubular, 4-5 toothed or lobed. *Corolla*.—Petals 4 or 5. *Stamens*.—Many, long, creamy, the conspicuous part of the flower. *Fruit*.—Ovate, 1-2 inches in diameter, the 4-lobed sepals form a hollow at tip, creamy-white, tinged with pale-pink on one side; pulp crisp, odor like a rose; seed rounded, 1 or 2; stem short. *Home*.—Tropical Asia.

French cherry, surinam cherry (*Eugenia uniflora* Linnaeus). Figure 51, c.—The French cherry is a beautiful shrub growing ten feet high and is common in gardens and on lawns in Honolulu.

Its small leaves are shiny and oval, its flowers inconspicuous, being small, solitary, fragrant. The fruit is attractive, and its juicy pulp, which contains a large round seed, has a pleasantly spicy and acid flavor, which is eaten raw or, preferably, made into jelly. It is bright-red, waxy-looking, round, and has about eight longitudinal furrows.—Corner of Judd and Liliha streets.

Leaves.—Small, glossy, pointed, ovate, short stemmed. *Flowers*.—Small, single, fragrant; four round, white petals spread out in one plane and surround a center crowded with rather long stamens. *Fruit*.—Bright-red, round, waxy, about 1 inch in diameter, cut longitudinally by 8 deep furrows; pulp juicy, pleasantly spicy and acid flavored; seed large, round. *Home*.—Brazil.

Java plum, Natal plum, jambolan plum (*Eugenia jambolana* Lamarck). Figure 51, *b*.—From somewhere in southern Asia comes the Java plum. It lives at elevations as high as 5,000 feet, especially in dry regions, and in form is a tall tree or a shrub. It is common in Hawaii. The twigs are cylindrical or compressed, and the bark of the trunk is gray to white and thick and flakes off in rough pieces. The evergreen, oval leaves have a pleasant aromatic odor, and their small, white, fragrant flowers are fringy and appear in clusters. In size and shape like a cherry, dark-purple fruit forms in bunches between September and November and consists of edible pulp surrounding a large, oblong seed. This tree is said to be the representative of the cosmogonic tree of India, the G'ambu, which bore the golden fruit of immortality. The seeds produced gold. Juice from the fruit formed the river Gambru, which has healing waters.—United States Experiment Station, Pensacola Street.

Leaves.—Ovate, opposite, 3-6 by 2-3 inches, blunt tipped or shortly pointed, tapering to base, evergreen, smooth, not shining, rather thin, light-green, aromatic when bruised, many faint lateral veins; stem $\frac{1}{4}$ - $\frac{1}{2}$ inch long. *Flowers*.—White, small, fragrant, in loose 3-forked panicles or cymes, about 3 inches long, from axils of fallen leaves. *Calyx*.—Shortly top shaped; limb cup shaped, truncate, or with very obscure segments. *Corolla*.—Petals united in a rounded hood, which falls when flower expands. *Stamens*.—Many; anthers small. *Fruit*.—Oblong, dark-purple, size and shape of a cherry, in large clusters $\frac{3}{8}$ - $\frac{1}{2}$ inch, crowned with truncate calyx limb, edible when ripe; seed large and oblong. *Home*.—Asia and tropical Australia.

Spanish cherry, Brazilian plum (*Eugenia brasiliensis* Lamarck). Figure 51, *d*.—In Makiki and Pauoa valleys are examples of the Spanish cherry, which was probably brought to Hawaii by Don

Marin. It is an evergreen shrub or low tree reaching a height of 20 feet (in some countries only 6 feet), and it needs a wet climate. Oval, round-tipped, short-stemmed leaves grow like scales along the branches. From the solitary flowers develop purple or scarlet cherries, which have a pleasant flavor, and flowers and fruit grow together on one tree from July to December. In Hawaii the tree bears best below an elevation of 200 feet.—United States Experiment Station, Pensacola Street.

Apparently the Brazilian plum is known in other islands of the Pacific, for Gill, who has written about part of Polynesia, tells a story of an island on which this kind of tree was growing. One time a man was found in a plum tree by the natives, who jubilantly ate not only the plums but also the man.

Leaves.—Ovate or obovate, about 3 by 1½ inches, point rounded, dark, shiny, scalelike along the branches, short stemmed. *Flowers*.—Solitary on axillary peduncles, petals free. *Fruit*.—Purple or scarlet, like a cherry in size and shape, having 4 long calyx lobes protruding from the end; pulp pleasant tasting. *Home*.—Brazil.

Ohia lehua (*Metrosideros polymorpha* Gaudichaud). Figure 51, *e*. —The ohia lehua is a favorite native tree and is the commonest kind in the forests of the Hawaiian islands. It is extremely variable, and many of its forms or close relatives are found on other Pacific islands, some as far south as New Zealand, where it is represented by such trees as the rata and the pohutukawa. In Hawaii the lehua grows between sea level and 9,000 feet. Under different conditions it assumes different forms, near the sea being dwarfed and gnarly, having a height of 10 feet or less; in large forests on some mountain slopes, especially on Mauna Loa and Mauna Kea, reaching a height of 100 feet. Around Kilauea Volcano it is associated with tree ferns (*hapuu*), high above which its umbrella-like crown of leafy branches towers. It makes use of the tree ferns, for the seeds fall on the damp fern trunks, germinate, and drop roots to the ground, which later strangle their hosts. Smaller trees grow on the mountains behind Honolulu.

Lehua leaves are small and oval or rounded, the young ones scarlet, the older dull-green. When in flower, the tree is especially attractive, for then bright-scarlet pompons generously dot the ends of branches. They probably gave rise to the name lehua, meaning "hair." Rarely do the flowers have other colors—salmon, pink, yel-

low, or white. They are full of honey, which is the food of the iiwi, a small bird with scarlet plumage matching the color of the flowers.

This is the most popular flower in Hawaii in song and story, and beautiful leis are made of it. It is the flower of the island of Hawaii. "Love slaves for the lehuas of Kaana," is a line from an old song that refers to the time, skill, and patience required to make a lehua lei. With characteristic aptness the Hawaiians made the red lehua groves sacred to Pele, goddess of volcanoes. Pele's sister, Hiiaka, had groves of lehua at Kilauea, which Pele in a jealous rage destroyed with streams of lava. The first man killed in battle was called a "lehua." Among the Maoris, a tree related to the ohia lehua was said to guard the entrance to the underworld.

A charming legend of Hawaii tells of Goddess Hina, who as an ohia lehua tree watched over a child in Waipio. At last the goddess assumed that form permanently and was worshipped under the name of Hina-ulu-ohia. Hawaiians say that if a lehua flower is plucked on the way to the mountains it will rain. "The sun in the flower nets of Hilo" is a poetical allusion to the setting sun seen through lehua blossoms.

The myrtles, the group to which this tree belongs, are sometimes called "ironwood," and the scientific name, *Metrosideros*, means in Greek "heart of iron." The wood is as hard as oak and is dark-red. It is now used for paving blocks, ties, flooring and other interior furnishings, and fuel. Formerly Hawaiians used it for idols, spears, mallets.—422 Judd Street (red one and white one); Tantalus; by road near Nuuanu Pali.

Leaves.—Opposite, ovate and pointed at each end or obovate or round, smooth or downy beneath, veins faint, young leaves scarlet; stems short or long. *Flowers*.—Bright-red, a few pink, yellow, almost white; in terminal, compound clusters, shortly stemmed, 3 together on a stem. *Calyx*.—Top shaped, less than $\frac{1}{4}$ inch long, smooth or matted with hairs, lobes triangular or rounded. *Corolla*.—As large as the calyx, oblong or obovate, petals 5, spreading. *Stamens*.—Red, many, much longer than the petals, the conspicuous part of the flower, anthers small. *Fruit*.—Capsule, 3-lobed, 3-valved, smooth or covered with matted hairs; seeds many, narrow, tapering towards each end. *Home*.—Hawaii.

Eucalyptus, blue gum (*Eucalyptus globulus* Labillardiere).—The best-known, most widely planted, and perhaps the most rapidly growing eucalyptus is the blue gum. In California it is the kind

most extensively planted. In Hawaii many trees are growing, preferring elevations between 1,000 and 4,500 feet, growing as high as 6,500 feet on Maui, where they are planted on a commercial scale. The tree is hardy, surviving a temperature as low as 19° and a yearly rainfall of eight inches. It produces wood as strong as American ash, stronger than some species of eucalyptus and weaker than others, in Australia serving well for fences, telephone poles, railway sleepers, spokes, ships; in Hawaii for flumes, camp buildings, ditches, ties, posts, shingles, wharves, piles, also for firewood, for shade and ornament, and for protection of watersheds. Near shore, ironwoods are best for windbreaks, eucalypts higher up. Eucalypts are giants among trees, being as high as sequoias but not so large. The blue gum reaches a great height, from 200 to 300 feet and a diameter of 10 feet or more, some trees increasing at a rate of 40 feet in four years. It is symmetrical, and a grayish-blue hue tinges the bark, which is smooth except at the base of the trunk.

Many of the 200 or so species of eucalypts are difficult to distinguish without flowers, fruit, and adult leaves. All kinds have alternate, smooth, stemmed leaves on adult parts, and paired, heart-shaped, stemless leaves on young parts. The blue gum has long, bluish leaves, and as they purify the air they are used in hospital wards, and the trees are planted in malarial regions of warm climates, as on the Campagna at Rome. Its flowers grow in umbrella-shaped clusters. The fruit ripens from December to February, as a waxy, warty capsule opening with a lid.—*Tantalus*.

Leaves.—Lanceolate, thick, stemmed, alternate, smooth, entire, penniveined; leaves on young parts sessile, opposite, cordate. *Flowers*.—In umbels near ends of branches. *Calyx*.—Tube and lid covered with bluish-white wax, warty, covering other parts of flower. *Corolla*.—Joined to calyx. *Stamens*.—Numerous; anthers longer than broad, opening by nearly parallel slits. *Fruit*.—Capsule, angular, opening by valves; seeds many, most angular, few fertile. *Home*.—Victoria and Tasmania.

Eucalyptus, lemon-scented gum (*Eucalyptus citriodora* Hooker). Plate XV, B.—A rapidly growing eucalyptus is the lemon-scented gum from Queensland, a slender tree growing as high as 125 feet and having a diameter of 4 feet. Smooth, white bark and long, slender, drooping branches are attractive features of the tree, which

is used ornamentally, especially in the warmest parts of California, also in Hawaii at 1,600 feet and lower. It prefers a tropical jungle climate and is killed by frost. The wood is excellent, being both strong and flexible, and it serves for such purposes as piles and girders. The leaves, long and narrow and light-green, yield much oil with a lemon-like odor, which is used in perfumery. Only one other eucalypt has a similar property. Creamy-white flower clusters appear from May to July.—Tantalus; 2859 Manoa Road; Old School Hall, Punahou.

Leaves.—Long, narrow, light-green, same color on both sides. *Flowers*.—Creamy-white, like those of other eucalypts; in terminal or lateral panicles. *Fruit*.—More or less urn shaped, at least 1/3 inch in diameter. *Home*.—Queensland.

Eucalyptus, swamp mahogany (*Eucalyptus robusta* Smith).—A eucalyptus that ordinarily prefers places avoided by other eucalypts, thriving in low swampy ground below 2,000 feet, mostly near the sea coast, in Hawaii prospers also in places exposed to wind and in poor soil. In Australia it grows to 100 feet, branches at about 50 feet, and has a diameter as great as 12 feet. The tree resists cyclones better than some of its nearest relatives, and its strong wood serves well for joists, ties, ships, and implements. The bark of the tree is rough, dark-brown, and persistent, being reddish on the branches. The long, leathery, pale-backed leaves form a massive crown of foliage. The flowers are profuse, large, creamy-white, and in some countries they appear from December to February. They are an especially valuable source of honey for bees.—Oahu Avenue near Kamehameha Avenue.

Leaves.—Dense, large, ovate-lanceolate, long pointed, dark-green on top, pale beneath, leathery, veins spreading almost at right angles. *Flowers*.—On broadly flattened peduncles, large, creamy-white, profuse. *Calyx*.—Pale; lid hemispherical below and becoming pointed above and broader than the tube. *Corolla*.—Wanting. *Stamens*.—Numerous, in many rows, with oblong-ovate anthers opening by parallel longitudinal slits. *Home*.—New South Wales and southern Queensland.

TERMINALIA FAMILY

(Combretaceae)

False kamani, umbrella tree (*Terminalia catappa* Linnaeus).
Plate XXIV, A.—Many years ago that rather small, picturesque tree,

the false *kamani*, was brought to Hawaii, where it is fairly common, growing well and fast near shore. It grows also in Porto Rico, though its home is southern Asia. As the branches are horizontal and wide spreading and heavy leaved, the trees furnish generous shade. The most striking feature is a scattering of red leaves among the green. After turning red, they remain for some time, and when they finally fall new ones soon take their place, thus keeping the tree evergreen, as this is a more or less continuous process. The leaves are large, thick, and clustered. From the small flowers, borne in large spikes, nuts develop that have won for this tree the name of Indian, or tropical, almond tree. A spongy covering encloses a hard case containing one or two small kernels, which are eaten raw or roasted.—Thomas Square; Capitol grounds; in front of Territorial Office Building.

Leaves.—Obovate, thick, shining, 6-9 inches long, in horizontal whorls, base slightly auricled or indented, turning red, stems very short. *Flowers*.—Small, white, in axillary solitary spikes, up to 7 inches long; polygamous, upper flowers pollen-bearing, lower perfect. *Calyx*.—Tubular, constricted above ovary, upper part bell-shaped and 5-lobed. *Corolla*.—No petals. *Stamens*.—Ten, in two series. *Fruit*.—Nutlike, indehiscent, almond shaped, with 2 ridges, smooth, 2 inches long or more; covering spongy, enclosing in a hard case 1 or 2 small kernels. *Home*.—Tropical Asia.

Quisqualis, Rangoon creeper (*Quisqualis indica* Linnaeus). Figure 52, *a*.—The quisqualis is common in the Tropics and in greenhouses in the North Temperate Zone. The name means "who? what?" for the plant changes its habit. It grows as an erect shrub for about three feet and then turns into a vine. It is tender and woody and has oblong or oval, long-pointed leaves. The flowers are particularly showy, being red or orange. They last well when cut, are fragrant, and appear in dry weather from June to September in some countries. In Honolulu the quisqualis seems less common than formerly. It can be propagated from cuttings, and it should be cut back annually.—Vineyard Street, just east of Nuuanu Avenue.

Leaves.—Oblong or ovate, acuminate, entire, 4 inches long, nearly smooth, most opposite or nearly so. *Flowers*.—Rose, scarlet, or orange, very showy, sweet. *Calyx*.—Tube very long (2-3 inches), slender, green, ending in acute but not long-pointed triangular teeth. *Corolla*.—Petals 5. *Stamens*.—Ten. *Fruit*.—Dry, oblong, leathery, with 5 very sharp angles hardly winged; 1-seeded. *Home*.—Malaysia.

Lasiandra (*Tibouchina granulosa*). Melastoma family. See page 311.

IVYWORT FAMILY

(Araliaceae)

Nothopanax, panax [*Nothopanax guilfoylei* (Cogniaux and Marchal) Merrill]. Plate II, *B*; figure 52, *d*.—One of the most familiar hedge plants is the nothopanax, with its light-gray bark, vertical branches, and dark-green, shining leaves, the leaves mostly white spotted or margined. The plant grows easily, starting from cuttings, and insects do not attack it. From its home somewhere in the southern Pacific it has been carried to many countries. Flowering is rare in Hawaii. Many varieties are in existence; but the leaves ordinarily consist of five to seven oval, slightly or deeply toothed leaflets. The leaves of some varieties are single, and in some the colors are reversed, being white with green margins.—Punahou Street; by Pleasanton hotel; corner of Wilder Avenue and Keeaumoku Street; 2256 Oahu Avenue; Makiki Valley, nursery of Board of Agriculture and Forestry.

Leaves.—Dark-green, shining, pinnate; leaflets 5-7, ovate, some spotted with white, edges white and few-toothed, tip rounded. *Flowers and fruit*.—Not known; not produced in Hawaii. *Home*.—Pacific islands.

Brassaia (*Brassaia actinophylla* F. von Mueller).—The brassaia, esteemed as an ornamental plant, grows here and there on lawns in Honolulu. It is easily recognized both by the form of its leaves, which are made up of several leaflets arranged in an umbrella shape, and by its unique flowers. Like arms of an octopus the radiating floral branches spread widely, bearing sucker-like prominences of small red flowers, which can be seen somewhere in Honolulu from April to October. This tree is not attacked by insects. When small it is common as a pot plant; but when growing outdoors it may reach a height of 40 feet.—Grounds of Normal School.

Leaves.—Large, compound; leaflets 7-16, radiating from a common stem on separate stalks in an umbrella shape, thick, smooth, oblong. *Flowers*.—Red, small, many crowded on axillary racemes with radiating spikes, 2 feet long or more. *Fruit*.—Contains about 12 one-seeded, dark-purple nuts. *Home*.—Australia.

PARSLEY FAMILY

(Umbelliferae)

Asiatic pennywort (*Hydrocotyle asiatica* Linnaeus). Figure 52, c.—Since the probable time of its arrival in Hawaii, early in the nineteenth century, the Asiatic pennywort has become a common weed between sea level and elevations above 1,000 feet, growing in lawns, fields, and gardens, where also in other parts of the world it is common. It is known to serve no useful purpose, and it crowds out other plants. New individuals are produced both by means of seeds and by runners. This pennywort is a small plant with rosettes of rounded, scalloped leaves, resembling those of the violet. But the flowers are quite different from violets, being small, inconspicuous, and growing close to the ground.—On lawns.

Leaves.—Growing in a rosette; blade ovate or heart shaped or kidney shaped, margin more or less scalloped; stem 1 inch long or more. *Flowers*.—In single umbel with 3-4 flowers, inconspicuous, minute, growing close to ground. *Fruit*.—Develops rapidly from flowers, in clusters, each with three 2-valved seed capsules, which ordinarily are scattered by water. *Home*.—Tropical and subtropical regions (Kew Index); warm parts of Asia and Australia (Pope).

ARDISIA FAMILY

(Myrsinaceae)

Ardisia (*Ardisia crenulata* Loddiges).—When about two feet high the ardisia looks best as an ornamental shrub, when higher usually losing its bottom foliage. Plants can be renewed by cutting their tops. They are compact and sweet scented. The leaves are wavy, thick, oblong; the nearly everblooming flowers, red and clustered, as are also its berry-like fruits, which hang for a year or more. One or two other kinds of ardisia are also growing in Honolulu.—In a few hedges.

Leaves.—Lanceolate-oblong, wavy margined and scalloped, alternate, thick, evergreen. *Flowers*.—Red, in clusters, bloom most of year. *Calyx*.—Persistent, segments 5. *Corolla*.—Rotate, 5-parted. *Stamens*.—Attached to throat of corolla, 5, anthers large. *Fruit*.—Berries in drooping clusters, perhaps 2 crops at once, coral-red, size of a pea, 1-seeded. *Home*.—China.



FIGURE 52.—Terminalia family: *a*, *quisqualis* (*Quisqualis indica*), leaves and flowers. Guttapercha family: *b*, *chico* (*Achras sapota*), leaf and fruit. Parsley family: *c*, *pennywort* (*Hydrocotyle asiatica*), leaves and green fruit. Ivywort family: *d*, *nothopanax* (*Nothopanax guilfoylei*), showing two kinds of leaflets. Leadwort family: *e*, *plumbago* (*Plumbago auriculata*), leaf and flowers.

LEADWORT FAMILY

(Plumbaginaceae)

Plumbago (*Plumbago auriculata* Lamarck, synonym *P. capensis* Thunberg). Figure 52, *c*.—As a hedge plant or ornamental shrub for lawns the pale-blue flowered plumbago is often used in Honolulu. At the end of a long, narrow tube, petals spread out, as in the phlox, to form the flower, many of which in rounded clusters are borne much of the year. The stems are slender, smooth, somewhat whitish, and ordinarily they do not grow very high; but in southern California, if allowed to do so, they reach 20 feet. Small, oblong leaves are scattered over the branches. A white-flowered variety is fairly common, a pink variety rare.—Corner of Piikoi and King streets; Moanalu Gardens; corner of Makiki and Dominis streets (blue); corner of Victoria and Beretania streets (white).

Leaves.—Oblong-ovate, blunt, scattered, alternate, narrowing into a short stem. *Flowers*.—Blue commonly, some white, some red, small, regular, in short racemes. *Calyx*.—Tube glandular-hairy, cylindrical, 5-toothed. *Corolla*.—Salver shaped, narrow tube $1\frac{1}{2}$ inches long, ending in 5 spreading, obovate lobes, much longer than calyx. *Stamens*.—Free from corolla tube, 5. *Pistil*.—Style 1 with 5 stigmas. *Fruit*.—Capsule, membranous, 5-valved, included in persistent perianth, circularly dehiscent near base; seed solitary. *Home*.—South Africa.

GUTTAPERCHA FAMILY

(Sapotaceae)

Chico, sapodilla, naseberry (*Achras sapota* Linnaeus). Figure 52, *b*.—In some gardens in Hawaii the South American chico, a small evergreen tree 10 to 20 feet tall, is cultivated. In Honolulu one is growing opposite the University Club on the Capitol grounds. The thick, oblong leaves, which are clustered at the rusty ends of branches, form rather dense foliage. Among them in season appear small, white flowers, later round fruit about the size of an egg, with slightly rough, russet-colored skin. The pulp of the fruit is apricot flavored and is divided into 10 to 12 parts containing a few seeds. From the juice, which is milky and sweet, much chewing gum is made.

Damascene plum, damson plum (*Chrysophyllum monopyrenum* Swartz).—The Damascene plum is a small tree that is not common in Honolulu, but is used much ornamentally in tropical America. Its

foliage is beautiful, as the shining, dark-green leaves are bronzy-gold on the under surface, which explains the name *Chrysophyllum*, "golden leaf." Fragrant, small, white flowers appear alone at the base of leaves. From August to December small, purplish-black fruits ripen, which have a white, sticky juice. The tree itself has a milky juice.—Grounds of Queen's Hospital; park at corner of King and Keeaumoku streets.

Leaves.—Oblong, pointed, alternate, short stemmed. *Flowers.*—Small, solitary, white, very fragrant, axillary. *Calyx.*—Ordinarily 5-parted. *Corolla.*—Tubular. *Stamens.*—Five. *Fruit.*—Small, oval, purplish-black, juice white and sticky; seed solitary, large. *Home.*—West Indies.

Star apple (*Chrysophyllum cainito* Linnaeus).—The fruit of the star apple is purple and round, and if it is cut in cross section the black, pumpkin-like seeds and core form a star. If ripe, the raw pulp is delicious and sweet, but if not perfectly ripe the milky juice makes it puckery. The tree, which has milky sap, is not common in Honolulu, but grows in some gardens. It likes sandy soil and cannot endure much frost. Under favorable conditions it reaches a height of 25 feet. Its branches are large, spread irregularly, and bear beautiful, thick foliage, the leaves being shining green on the upper side and silky and white to golden-brown beneath. Larger fruit, not so sweet, greenish with purple shades, is borne by a variety.—56 Wyllie Street; Haleiwa, on grounds of hotel.

Leaves.—Oblong, shiny, alternate, green on upper side, silky and white to golden-brown beneath. *Flowers.*—Small, solitary or in bunches at the nodes. *Calyx.*—Ordinarily 5-parted. *Corolla.*—Tubular to bell shaped, ordinarily 5-lobed. *Stamens.*—On corolla tube, 5. *Fruit.*—Round, about 3 inches in diameter; rind purple, smooth, tough; pulp edible, sweet, juice milky, core and seeds radiating regularly from the center; seeds large, pumpkin-like. *Home.*—West Indies.

OLIVE FAMILY

(Oleaceae)

Noronhia (*Noronhia emarginata* Thouars). Figure 53, a.—A rare evergreen tree in Honolulu, the noronhia, in a general way resembles the native *kamani* and the mammee apple. The leaves look similar, but have few, indistinct veins. Yellow, fragrant flowers grow in clusters. The fruit is purple, nearly round, about an inch in diameter, and a sweet-tasting pulp encloses a large seed. The tree

comes from Madagascar. It is growing in Honolulu at Fernhurst, on Thomas Square, and on the park at the corner of King and Keeaumoku streets.

Olive (*Olea europea* Linnaeus).—The olive tree, so common both wild and cultivated around the Mediterranean Sea, was brought there in early times from southwestern Asia. The oil pressed from the fruit for food and for Castile soap and the fruit itself, preserved in vinegar or salty liquid, are important products in southern Europe, where the yield is abundant. Spain alone produces about 250 million pounds of oil a year, each acre yielding about 700 gallons. Ten to twenty per cent of oil is contained in each olive. In Hawaii, where the tree was introduced some time ago, the yield is little or nothing, which may be explained by the fact that it grows best on well-drained limestone soil where strong winds are absent. It is of medium size, few trees exceeding 25 feet, though in Corfu it grows 60 feet high and forms beautiful forests. It lives long, and it has developed many varieties. The long, narrow, evergreen leaves are well known for their color—dull-green above, silvery beneath—and are an ancient emblem of peace.—Corner of Keeaumoku and Dominis streets.



FIGURE 53.—Olive family: a, leaf of noronhia (*Noronhia emarginata*); b, star jasmine (*Jasminum multiflorum*), leaves and flower.

According to Greek mythology the olive was the gift of Minerva. Before the city of Athens was named, the gods decided that the city should be awarded to the god or goddess who could produce the gift most useful to man. Neptune gave the horse, Minerva the olive. The gods decided that the horse would bring war and anguish, the olive peace; therefore the city was called "Athene," the Greek name of Minerva. In the Olympic games the victors were decked with olive leaves. In Egyptian mythology olive trees were inhabited by demons; but in Christendom the olive branch has come to be the symbol of peace. The Christians of Jerusalem think that the olive trees of Olivet are the same trees that grew there during the life of Christ. Judas is said to have hanged himself on an olive tree.

Leaves.—Long, narrow, pointed, thick, opposite, dull-green above, silvery beneath, evergreen, small. *Flowers*.—Small, yellow-white, most imperfect, in compound axillary racemes or at end of twigs, fragrant. *Calyx*.—Short, small, 4-toothed. *Corolla*.—Lacking in some flowers, short tubed, 4 valvate lobes. *Stamens*.—At base of corolla tube, 2. *Pistil*.—Short; stigma 2-cleft. *Fruit*.—Drupe, bluish-black, elliptical, smooth, small, an edible pulp covered by a thin skin surrounds an elliptical stone. *Home*.—Southwestern Asia.

Privet (*Ligustrum ovalifolium* Hasskarl).—The Japanese or California privet is a stiff but attractive shrub 15 feet high or less that is much used for hedges. Though Japan is its home, it grows well in the Tropics and in the United States is hardy as far north as New York City. It is one of the best seaside plants, growing well even in salt spray. Like the olive tree it has smooth stems. Elliptical or oval leaves, pointed at each end, grow in pairs and are lighter on the under side. At the ends of branches whitish flowers rise in clusters, particularly in July, later being replaced by a decorative, berry-like fruit.—In a few gardens.

Leaves.—Elliptic-ovate or elliptic-oblong, acute, dark-green and glossy above, yellowish-green beneath (none variegated), 1 1/2-2 1/2 inches long, opposite, entire, short stemmed. *Flowers*.—Many, in erect, terminal panicles, rather compact, to 3 inches long, whitish, flowers almost sessile. *Calyx*.—Bell shaped, obscurely 4-toothed, small. *Corolla*.—Funnel shaped with 4 spreading lobes. *Stamens*.—At throat of corolla, 2. *Pistil*.—Style moderately long, stigma club shaped. *Fruit*.—Attractive, berry-like drupe. *Home*.—Japan.

Star jasmine [*Jasminum multiflorum* (Burmamn) Roth]. Figure 53, *b*.—The star jasmine is a rather hardy vine that climbs over fences, trellises, and pergolas and the year round is dotted with white, fragrant, starlike flowers. The stems are rusty-hairy; the leaves are

pointed-oval and rather thick. Several different kinds of jasmine are known in Honolulu.—Corner of Wilder Avenue and Keeaumoku Street; corner of University and Metcalf streets; Makiki Valley, nursery of Board of Agriculture and Forestry.

Leaves.—Ovate-acute, opposite, small, rather thick, short stemmed. *Flowers*.—White, fragrant, some semi-double. *Calyx*.—Shortly tubular, teeth $\frac{2}{3}$ inch long, with spreading yellow hairs. *Corolla*.—Much exceeds calyx, a tube with 4-9 overlapping, spreading lobes. *Stamens*.—Included in corolla tube, 2, filaments short, anthers oblong. *Pistil*.—Style simple, stigmas 2. *Fruit*.—A twin berry, both parts not always developed. *Home*.—Tropical Asia.

STRYCHNINE FAMILY

(Loganiaceae)

Pua, fagraea (*Fagraea berteriana* A. Gray). Figure 54, *a*.—The flower of the Marquesas Islands is the *pua*, a fragrant, conspicuous, tubular blossom, which changes with age from white to yellow. Lately the Territorial Department of Agriculture has raised many plants from seed and has caused them to be distributed in Honolulu to people with gardens, where previously they were rare, the oldest said to be growing at Maunawili. Large *pua* are trees as high as 30 feet with a diameter of 3 feet; but in Hawaii none has attained even half



FIGURE 54.—Strychnine family: *a*, *pua* (*Fagraea berteriana*), leaves, flowers, green fruit; *b*, summer lilac (*Buddleia japonica*), tip of young plant, showing leaves and flowers.

those dimensions. When still quite small a *pua* bears flowers.—Corner of Kamehameha Avenue and Lanihuli Drive.

In Tahitian legend the first *pua* tree was brought from the tenth heaven by Tane, god of the forests. Hence the tree is sacred to him, and images of him were always made of *pua* wood. In Mangaiian legend the *pua* was the tree that guarded the entrance to the land of the spirits in the underworld.

Leaves.—Opposite, thick, oblong-elliptical, acute, 6 by 3 inches, stemmed. *Flowers*.—In terminal cymes. *Calyx*.—Small, lobes 5, rounded, overlapping. *Corolla*.—Tubular, fragrant, white turning to yellow, 1 inch long, lobes 5, much contorted. *Stamens*.—Inserted in corolla tube, 5, anthers versatile. *Pistil*.—Style long, simple, stigma large, capitate. *Fruit*.—Enlarged calyx, fleshy, indehiscent, scarlet, 3/4 inch in diameter, round to ellipsoidal, 2-locular; seeds numerous, small, black immersed in pulp. *Home*.—Pacific islands.

Summer lilac (*Buddleia japonica* Linden). Figure 54, *b*.—Among the 70 or more kinds of buddleias known, one, the summer lilac, is an attractive plant in gardens here and there in Honolulu when at flowering time its stems bear clusters crowded with small lilac flowers. Its leaves are paired on ringed, quadrangular branches. The plant is shrubby and three to six feet high.—2326 Armstrong Street; 2144 Manoa Road.

Leaves.—Opposite, short stemmed, deciduous or semi-persistent, slightly woolly beneath, ovate-lanceolate, acuminate, remotely denticulate, 3-6 inches long. *Flowers*.—In dense, terminal, nearly erect panicles 4-8 inches long. *Calyx*.—Segments 4 or 5. *Corolla*.—Slightly curved tube about 1/2 inch long, 4-lobed, lilac outside with grayish wool. *Stamens*.—Included, 4. *Fruit*.—Capsule, 2-celled; many tiny seeds. *Home*.—Japan.

PERIWINKLE FAMILY

(Apocynaceae)

Allamanda (*Allamanda hendersoni* Bulliard). Figure 55, *e*.—An allamanda that grows as a climbing shrub with yellow-orange flowers about five inches long, is common in Honolulu. It is stronger than the small-flowered yellow allamanda. The flowers, generous both in size and number, add their cheerful tone to roadsides and to arbors. Its long, brownish-purple buds are distinctive and grow among smooth, dark-green leaves.—Vancouver Highway, near Mills School, and near Oahu Avenue.

Leaves.—Mostly whorled in fours, entire, large, oval, pointed, thick, smooth. *Flowers*.—Yellow-orange with five light spots in the throat, terminal, funnel-shaped, tube swollen, buds brownish-purple. *Corolla*.—Nearly 5 inches long, thick, 5 spreading lobes. *Stamens*.—Five. *Home*.—Guiana.

Allamanda (*Allamanda cathartica* Linnaeus).—An allamanda with yellow but smaller flowers and smaller leaves than those of *A. hendersoni* does not always have so strong a tendency to climb as the large-flowered kind. Its leaves are thin and mostly wavy-margined. Comparatively shorter lobes and a longer tube distinguish the blossoms.—Corner of Dominis and Keeaumoku streets.

Leaves.—Obovate, most in fours, most with wavy edges, thin, pointed, rather small. *Flowers*.—Yellow, throat with white marks, 3 inches or less in diameter, tube gibbous or curved. *Corolla*.—Lobes 5, pointed on one angle. *Stamens*.—Five, filaments short. *Pistil*.—Style slender, as long as corolla, enlarging towards stigma; stigma short, conical, bifid. *Fruit*.—Large, prickly seed cases. *Home*.—South America.

Allamanda (*Allamanda blanchetii* DeCandolle).—Purplish flowers, some as large as three inches across, and leaves with hairs on both sides are the most striking features of an allamanda from Brazil, which otherwise closely resembles the small yellow kind (*A. cathartica*). This allamanda is not common in Honolulu, but may be seen in a few gardens, as at the corner of Heulu and Keeaumoku streets and on the grounds of the University of Hawaii. It bears many flowers in July and August.

Plumeria, temple tree, frangipanni, graveyard flowers (*Plumeria acutifolia* Poiret). Figure 55, *b*.—The umbrella-shaped crown, dotted with star-shaped flowers, of the plumeria tree is a common sight in Honolulu, especially in cemeteries. It is a small, stiff, awkward-looking tree with thick branches, which are scarred with leaf stems. Though at home in tropical America, it has for long had adopted homes in the low regions of many lands. In Ceylon it is found around Buddhist shrines, where the flowers are a favorite offering. It has a sticky, milky juice containing a little resinous rubber. At the ends of branches, bunches of long leaves grow. They fall in the winter, and new ones appear in the spring soon after the flowering season begins. The popularity of the tree is due to its exceedingly fragrant and pretty flowers, which are yellow or waxy-white with yellow centers. Clustered at the tips of branches, they come out on the bare tree near the end of winter,

FIGURE 55.—Periwinkle family: *a*, be-still tree (*Thevetia nereifolia*), leaves, flower, bud, fruit; *b*, plumeria (*Plumeria acutifolia*), leaf and flower; *c*, carissa (*Carissa* sp.), leaves, flower, thorn; *d*, vinca rosea (*Lochnera rosea*), leaves and flowers; *e*, allamanda (*Allamanda hendersoni*), leaves, flower, bud; *f*, beaumontia (*Beaumontia grandiflora*), leaves, flower, bud; *g*, maile (*Alyxia olivaeformis*), leaves and fruit; *h*, oleander (*Nerium* sp.), leaves, flower, seed case.



soon afterwards being joined by the leaves and continuing nearly all the year. As is noticeable on the piers on steamer days, plumeria flowers are among the commonest kinds for leis.—Cemeteries on Pensacola Street and on Nuuanu Avenue.

Leaves.—Alternate, at tips of branches, 8-16 by 3 inches, pointed at each end, feather-like veins join a vein running parallel to the margin of the leaf, deciduous. *Flowers*.—In clusters of 2 to more than 20 at the tips of branched flowering stems, heavy perfume. *Corolla*.—Five overlapping yellow or white oval lobes, joining at base in a narrow tube, about 2 inches in diameter. *Stamens*.—Inside tube, 5. *Fruit*.—Oblong or elliptical follicle, two, biforked. *Home*.—Tropical America.

Red plumeria, frangipanni (*Plumeria rubra* Linnaeus).—From tropical America, including Mexico and Guiana, comes the red plumeria, a low tree or shrub, which has golden-colored flowers tipped with bright-rose. The leaves are comparatively short, measuring five to eight inches. Only a few red plumerias are growing in Honolulu, one at the corner of Keeaumoku and Dominis streets. Though the red kind is not common, hybrids of the yellow and red which have pink flowers, are fairly so. The ordinary kind furnishes the pollen.

Madagascar periwinkle, vinca rosea [*Lochnera rosca* (Linnaeus) Reichenbach]. Figure 55, *d*.—As the Madagascar periwinkle is cosmopolitan in the Tropics, being found there both cultivated and wild, the first part of its popular name is hardly suitable. It is a foot or so high, somewhat shrubby, and bears oblong leaves with conspicuous veins. The gay-colored flowers—rosy or lavender or white, many with a reddish eye—bloom throughout the year.—Bishop Museum, along front wall.

Leaves.—Oblong, narrowed at base, veiny; stem glandular at base. *Flowers*.—Everblooming, rosy-purple or white, with or without a reddish eye in the small opening. *Calyx*.—Lobes linear. *Corolla*.—Petals 5, spread out flat, obovate, short point on tip of each, joining in a narrow tube. *Stamens*.—Included in tube, five. *Fruit*.—Follicles, two, containing several seeds. *Home*.—Cosmopolitan in the Tropics.

Be-still tree, yellow oleander, trumpet flower (*Thevetia nerifolia* Jussieu). Figure 55, *a*.—Myriads of narrow leaves closely dotted with yellow trumpet-shaped flowers is the general appearance of the highly ornamental be-still tree, which is not only everblooming but evergreen. It is a small tree reaching a height of 20 feet and has spreading branches beginning near the base. The milky sap is

poisonous in large doses, a useful medicine in small doses. The leaves are narrower than those of the oleander and are smooth and stemless. The flowers have a mild fragrance. In Ceylon the seeds, which are contained in round cases, are called "lucky beans" or "lucky seeds" and are worn as pendants or charms. Though at home in the Tropics, the be-still tree can survive a freezing temperature.—Corner of Fort and Kuakini streets, by bridge; corner of Vancouver Highway and Oahu Avenue; grounds of Central Union Church; Kaahumanu Society Cemetery on School Street.

Leaves.—Smooth, stemless, 4-5 inches long, narrow, closely clustered at and near branch ends, margins revolute, abundant. *Flowers*.—Bell-shaped, yellow, about 3 inches long, on stems in branch and leaf axils, abundant. *Fruit*.—Nearly round, smooth drupe, black when ripe, like a hickory nut in size and shape. *Home*.—Tropical America.

Thevetia (*Thevetia iccotli* DeCandolle).—A thevetia from Mexico has larger flowers than the be-still tree. Its leaves are long, narrow, and downy beneath, and the margins are rolled under. It has been planted in Kapiolani Park.

Beaumontia, Nepal trumpet flower (*Beaumontia grandiflora* Wallich). Figure 55, *f*.—A beautiful, tall vine rather rare in Honolulu is the beaumontia. It is cultivated in many countries, but perhaps only in its home in the eastern Himalayas does it climb over tall trees. It is admired for its large, white, fragrant, bell-shaped flowers, which grow in clusters at the ends of branches of the previous season's growth and in Honolulu appear in February. The leaves are oval and wavy-margined.—Punahou campus, beside Chemistry Building; Kamehameha Avenue, near car switch.

Leaves.—Obovate, tip sharp, margin wavy. *Flowers*.—Large, white, in terminal clusters on last year's wood. *Calyx*.—Sepals large, oval, wavy, pink-tipped, 5. *Corolla*.—Bell-shaped, tube veined with green, 5-cleft. *Stamens*.—Five. *Home*.—Eastern India.

Carissa (*Carissa* species). Figure 55, *c*.—Red, oval, edible berries an inch long or more grow on the small tree, or large shrub, the carissa. In India they are cooked in tarts, also pickled, and when ripe are made into jelly. The many branches of this plant are forked and rigid, and they bristle at each node with a pair of horizontal spines. Spininess suggests desert regions, and the home of this plant is in dry regions in parts of Africa or southern Asia.

It is an effective hedge plant. The rather narrow leaves are blunt and smooth, and from their axils, where present near the ends of stems, grow white, fragrant flowers.—Near entrance to Library, on Likelike Street; hedge by road in Makiki Valley, near foot of Round Top.

Leaves.—Oblong-oval, opposite, thick, 1+ inches long, obtuse at apex, smooth. *Flowers*.—White, fragrant, short-stalked, in clusters at end of short axillary and terminal peduncles. *Calyx*.—Very small, segments 5, linear, very acute. *Corolla*.—Tube cylindrical, one-half inch long or more; lobes 5, overlapping to right, lanceolate, spreading. *Stamens*.—Five, distinct, inserted in corolla tube, included. *Pistil*.—Stigma 1, conical; ovary 2 celled. *Fruit*.—Red edible, about an inch long, oval, bluntly pointed, smooth, fleshy, indehiscent, containing 2-4 small seeds. *Home*.—Eastern Hemisphere.

Maile (*Alyxia olivaciformis* Gaudichaud). Figure 55. *g*.—The *maile* is a favorite plant of the Hawaiians, the fragrant bark of its stems and the fragrant, elliptical, and highly polished leaves being indispensable decorations at festive times for houses as well as for people. It is also wound about orange paper *ilima* leis commonly seen at the piers. As a straggling or twining shrub, *maile* grows in native forests of the lower and middle mountain regions. The leaves, growing in threes, bear in their axils three or four small yellowish flowers, from each of which twinned black fruit may ripen.—Wild in the woods.

A Hawaiian wrote: "*Maile* is used for leis for the people; for men, women, and children; for the chiefs, the noted people, and the rich people; for the farmer, the oppressed, the branded servant. . . . and because it was so very much desired by the people, therefore it was greatly used in the composing of songs, hulas, chants, dirges, and various other compositions."

Laka, goddess of the hula, was invoked as the goddess of the *maile*. Some say that it was one of the forms she could take at will, others that the *maile* was her emblem. A tapu-lifting prayer of the hula dancers has the following lines:

Oh wildwood bouquet, oh Laka!
Hers are the growths that stand here.
Suppliants we to Laka.
The prayer to Laka has power;
The *maile* of Laka stands to the fore.
The *maile* vine now casts its seeds.

In Hawaiian legend there were four sisters: Brittle Maile, Luxuriant Maile, Greedy Maile, and Sweet-leaved Maile, who had five brothers. One of the sisters married the king of Kohala, who, because the five brothers would not give him their magic fishhook, had the brothers killed. Then a fifth sister, who had magic power, sang an incantation and with *ieie* and *maile* vines snared and killed the king. She restored the brothers to life, and brothers and sisters left Kohala forever.

Leaves.—Opposite, in threes, elliptical, 1 1/2-2 1/4 by 1/2-3/4 inches, tapering to a point at both ends, on stems 1 1/2-2 inches long, leathery, shiny, edges generally rolled back, fragrant. *Flowers*.—Axillary, on stems 1/3 of an inch long, bearing 3-4 flowers. *Calyx*.—Small, 4-5 parted. *Corolla*.—Yellowish, small, salver-shaped, with a short tube slightly widening below the contracted throat, downy within, the 4-5 oval lobes a third as long as the tube. *Stamens*.—Enclosed in the tube, 4-5. *Fruit*.—Drupes, often twins in one flower, fleshy, black, oblong, some curved, 1/2 inch long or more. *Home*.—Hawaii.

Oleander (*Nerium oleander* Linnaeus). Figure 55, *h*.—The oleander is a common shrub in Honolulu and is cultivated in many warm countries. In its home in warm countries of the Eastern Hemisphere it grows wild, mostly in damp places, a preference that gave rise to the name *Nerium*, from the Greek *neros*, meaning "moist." The gracefully bending stems rise from the ground in a crowded cluster and are topped at a height of from 7 to 15 feet with a crown of long, narrow, dull, evergreen leaves. Large, heavy heads of scentless flowers—single or double, ranging in color from white to crimson—terminate the stems most of the year. Apparently the oleander is not attacked by plant or insect pests, and possibly it is poisonous to them as much as to human beings and cattle. For not only are flowers, foliage, and roots quite poisonous, but also the wood, which has been known to poison food cooked with it in Hawaiian ovens. It is the milky juice that is poisonous, which is used in small quantities as a cure for skin diseases. Wind in oleanders is said to make delicate voice-like music. The Moors attribute great magical virtue to "the sultan of the oleander," which is a stalk with four pairs of leaves clustered around it.—Kalakaua Avenue near King Street.

Leaves.—In twos or threes, long, narrow, tapering at each end, leathery, veins feather-like, dull, evergreen, broader than *N. indicum*. *Flowers*.—Scentless, larger than *N. indicum*, terminal, abundant, heads large and heavy; color range: white, light-pink, dark-pink, crimson, buff; single and double; salver-

shaped single ones five-lobed, lobes twisted to right, 1 1/2-3 inches across; corolla tube cylindrical at base, throat bell-shaped and containing 5 wide or narrow teeth. *Calyx*.—Many glands inside at base. *Fruit*.—Long, narrow capsule, developing rarely from any but single flowers. *Home*.—Mediterranean region, Orient.

Oleander (*Nerium indicum* Miller).—Especially common in Honolulu is an oleander with white, pink, or red flowers. These are fragrant, particularly the red, which are double. Seeds rarely develop from the red flowers. Besides having an odor, the flowers differ from those of the preceding kind in being smaller; and the leaves are narrower. But in many ways the two species are alike. —Kalakaua Avenue near King Street.

Leaves.—In whorls of 3 or 4, linear-lanceolate, pointed. *Flowers*.—Single and double; white, pink, or red; about 2 inches in diameter; fragrant, especially the red, which are double. *Fruit*.—Long, narrow follicles. *Home*.—India, Japan, Persia.

MILKWEED FAMILY

(Asclepiadaceae)

Cryptostegia (*Cryptostegia grandiflora* R. Brown).—With twining stem and branches the cryptostegia vine climbs up trellises in a few places in Honolulu. It is found in many tropical countries, and in India it is cultivated for rubber, because its juice when exposed to sunshine produces rubber. From the stems comes a good fiber. The flowers change with age from reddish-purple to lavender or pink, and the twisted buds open to flowers with an expanse of two inches, growing in forked clusters.—In a few gardens.

Leaves.—Opposite, short-stemmed, oblong, entire, 3 by 1 1/2 inches. *Flowers*.—Reddish-purple, lavender, pink, 2 inches in diameter, in a forked cluster. *Home*.—Tropical Africa.

Crown flower, giant milkweed (*Calotropis gigantea* R. Brown). Figure 56, a.—A large shrub reaching a height of ten feet, having thick, downy branches and yellowish-white furrowed bark, is called in Honolulu the "crown flower." It was a great favorite of the Hawaiian queen, Liliuokalani; but it did not become common until after her death. In these times, on steamer day, he who wishes may buy leis made of the pale-lavender flowers. They have a pleasing sweetish odor that becomes less pleasing when they are crushed. At times they crowd the shrubs, and some may be found throughout

the year. The broad, thick leaves are woolly beneath and are a cure for swellings. The seeds are covered with fine silky hairs that are used for stuffing pillows; and other parts of the plant are also useful. The abundant milky juice is said to furnish a remedy for leprosy, the bark of the root a tonic. From the stem is procured a fine fiber used for fishing lines and also charcoal suitable for gun-powder. In its home in India this shrub is common in low waste lands; in Honolulu it is an ornamental shrub, the popularity of which is increasing.—665 Hotel Street; 2347 Vancouver Highway.

In India the flower is sacred to Siva. The buds form one of the flowers on the darts of Kama, Indian god of love, who shoots his



FIGURE 36.—Milkweed family: a, crown flower (*Calotropis gigantea*), leaves and flowers; b, wax plant (*Hoya carnosa*), leaf and flowers; c, stephanotis (*Stephanotis floribunda*), leaves and flowers.

arrows into the hearts of mortals. Among the Vellalas of India a fourth marriage is considered very unlucky, and no father will give his daughter to be a fourth wife. The prospective bridegroom solves this difficulty by marrying a crown-flower shrub and then is free to seek a fifth wife.

Leaves.—Broad, whitish and woolly beneath, nearly sessile, 4-8 inches long, oval-oblong, indented at base, acute, rather thick. *Flowers*.—Lavender or nearly white, in bifurcated cymes; peduncles long, stout, between leaves (not axillary). *Calyx*.—Sepals oval, acute, cottony. *Corolla*.—Lobes triangular-oblong, subacute, 1 1/2-1 3/4 inches in diameter. *Fruit*.—Not formed in Hawaii; follicles 3 1/2-4 inches, broad, thick, fleshy, somewhat corrugated, smooth; many seeds, covered with long silky hairs. *Home*.—India.

Stephanotis (*Stephanotis floribunda* Brongniart). Figure 56, *c*.—A vine with tubular, wax-white flowers that scatter their sweet perfume from many clusters is the stephanotis. When the flowers fall, long elliptical seed cases form, within the smooth fleshy covering of which are melon-like seeds. The shining, leathery leaves also are elliptical. In Honolulu this attractive vine unfortunately suffers from attacks of the mealy bug.—Grounds of Royal Hawaiian hotel.

Leaves.—Elliptical, short pointed, thick, shining, opposite, leathery. *Flowers*.—Waxy-white, tubular, fragrant, in many clusters, 1-2 inches long. *Calyx*.—A quarter as long as the corolla tube, 5-parted. *Corolla*.—Funnel form, the tube enlarged at the base, 5-6 lobed. *Fruit*.—Follicle, 3-4 inches long, elliptical, smooth, fleshy, flat and rounded seeds provided with a tuft of hair. *Home*.—Madagascar.

Wax plant (*Hoya carnosa* R. Brown). Figure 56, *b*.—The wax plant is a high-growing vine. Fleshy, oval leaves grow from it in pairs, and from their axils develop fragrant clusters of large waxy flowers, which are star shaped and white except for a pink center. From its home in southern Asia the wax plant has been taken to many countries, but is not very common in Honolulu. At least in southern United States it is nearly everblooming.—Corner of Kamehameha Avenue, opposite Liloa Rise; roof garden, Young hotel.

Leaves.—Succulent, shining, oval-oblong, pointed, short-stemmed, entire, opposite. *Flowers*.—Rather large, white with pink center, waxy, fragrant, in axillary clusters. *Calyx*.—Divided to base, 5 segments. *Corolla*.—Rotate, 5-lobed, thick, convex, spreading in a horizontal star, joined to stamens. *Stamens*.—Joined, 5, pollen masses 10, short, fixed by their base in pairs to 5 glands of stigma, which they cover. *Fruit*.—In narrow follicles suddenly narrowed at the top and prolonged into a point, smooth; seeds small with long cluster of bracts at one end. *Home*.—Tropical Asia and Australia.

MORNING-GLORY FAMILY

(Convolvulaceae)

Sweet potato, uala, kumara (*Ipomoea batatas* Poirét).—The sweet potato is a vigorous plant with purple stems that spread their dark-green leaves closely over the ground. Their large tuberous roots, which range in color from white to orange to purple and grow closely under the center of the plant, are a familiar and valuable food, next to bananas yielding the largest number of calories

From prehistoric times many varieties of sweet potatoes have been cultivated in many parts of the world. Possibly originating in America, they are said to have been cultivated in Hawaii probably since 500 A. D., having arrived with the taro. On the island of Niihau, which was once thickly populated, this vegetable was eaten instead of taro.

In shape the leaves vary greatly, from heart-shaped to five-lobed or five-angled. Flowers are pinkish-lavender in color, tubular below and spreading out widely, and are abundant if plants are not well cared for. Good commercial varieties do not bloom. Some varieties have much longer vines than others, and some are vineless and bushy.

an acre—about six million.

Where climate is warm enough, with little labor large crops result. In Hawaii different varieties mature between three and seven months. They are planted in three ways: in ridges, in individual mounds, and on flat ground. More than 350 acres are devoted to them, mostly on Hawaii and Maui, from sea level to 1,500 feet, and 100 plants produce about 150 pounds of tubers, or 200 to 400 bushels an acre. Besides the use of the tubers as food for human beings, the tops are fed to stock and also cooked and eaten as greens by people.—Upper Manoa Valley.

The sweet potato was the principal food of the Maoris of New Zealand and was believed to be the personification of Rongo, the son of the great god Tane. There were many rites of planting and digging, ending with a feast at the outskirts of the field. Following is one of the chants used in making the hillocks:

FIGURE 57.—Morning-glory family: *a*, morning-glory (*Ipomoea insularis*), leaves and flowers; *b*, morning-glory (*Ipomoea palmata*), leaves, flower, seed case; *c*, prince's vine (*Ipomoea horsfalliae*), leaves and flowers; *d*, Ceylon morning-glory (*Ipomoea tuberosa*), fruit; *e*, cypress vine (*Ipomoea quamoclit*); *f*, beach morning-glory (*Ipomoea pes-caprae*), leaves, new and old flowers, buds, seed case.



Where then is the man
 Who owns this cultivation
 That he cometh not
 To see the regular spacing
 Of the hillocks of his garden;
 To direct the spacing of the hillocks
 In his cultivation?
 The heaping up of the earth
 That comes with the time of warmth.
 O Rongo.

A Maori tradition tells of two men who came to New Zealand on floating islands of pumice stone that were moved by their incantations. When they landed it was bitterly cold, and one of the men, Taukata, uttered a chant to make the sun rise and warm them. The chant was heard by a maiden who had come for water, and she led them to a village where women were pounding fern root for the morning meal. The noise of the pounding astonished the men and they asked if it were thunder. The men were invited to partake; but they could hardly eat the fern root and instead took from their girdles dried sweet potato from Hawaiki, the fragrance of which pleased the men of New Zealand so much that they went to far Hawaiki after it and were instructed in the mysteries of planting and storing of the crop as well as in the proper ceremonies, which ended with a human sacrifice.

Leaves.—Oval and indented at base or 5-angled or 5-lobed, very variable; stems purplish. *Flowers*.—Pinkish-lavender, tubular and spreading, several, 1-2 inches wide. *Home*.—Tropical regions, possibly America.

Morning-glory, koali-awahia (*Ipomoea insularis* Steudel). Figure 57, a.—The commonest and prettiest morning-glory in Hawaii grows almost everywhere, except in forests, from the coast to an elevation of 2,000 feet. It drapes itself over grass and shrubs in fields and by roads, often in the company of the pink-flowered *koali-ai*, which it resembles in many ways. But its leaves are heart-shaped and the flowers have a different color. On opening in the morning they are a delicate bluish-purple, and through the day they change from purple to pink. They close in the evening. It is said that when pounded the stems and roots are good for bruises and broken bones. According to one authority, this morning-glory originated in Australia.

The vine was much used by the Hawaiians as a swing. In the story of Hiku and Kawelu, Hiku was lowered into the underworld on the *koali* when he was searching for his sweetheart. Swinging back and forth, he sang,

"I have a swing, a swing,
And the rest of you children have none!
Whom will I let on my swing?
Not one of this crowd, not one."

He thus enticed Kawelu, who did not recognize him, onto the swing, brought her spirit back to earth, and restored it to her body.

Morning-glory, koali-ai (*Ipomoea palmata* Mann). Figure 57, b.—On fences or shrubs in low country in and around Honolulu and in many other tropical countries trail or twine for long distances, even as far as 40 feet, the vines of one kind of morning-glory. Hawaiians formerly used them as cordage for fastening together parts of houses; and the large, tuberous roots and the main stems, though somewhat bitter, they used as food. Also, the juice of the roots has been used medicinally to increase the flow of milk and other secretions. Pink or purplish bell-shaped flowers are scattered among the leaves, which vary in form and size and have five to seven fingers. The seeds, tipped with a tuft of wool, are contained in a little oval case, to the outside of which the flower parts cling.—In fields and on roadsides.

Leaves.—Varying in size and form, 3-7 inches wide, deeply 5-7 parted; segments elliptic, entire, smooth, pale and prominently veined beneath; stem nearly as long as blade, smooth, channeled above. *Flowers*.—Pinkish-purple or pink, numerous, in a 2-branched cyme, on smooth pedicels; peduncle stout, longer than petiole. *Calyx*.—Sepals less than 1/3 inch long, rounded, blunt, concave, smooth. *Corolla*.—Broadly bell-shaped, 1 1/2-3 inches wide, 5-lobed, lobes notched. *Fruit*.—Oval, 1/2 inch long, surrounded by enlarged, rather fleshy sepals; seeds with a dense tuft of dirty-white wool at apex. *Home*.—Tropical Africa.

Moon flower (*Ipomoea bona-nox* Linnaeus).—Growing here and there mixed with another kind of morning-glory (*koali-awahia*) is the moon flower, a long, smooth or somewhat knobby vine with large spear-shaped and heart-shaped leaves, which are long pointed and long stemmed. The large, fragrant, trumpet-shaped flowers are pure-white, except some that have greenish plaits. They open late in the afternoon and fade during the next forenoon. New plants are grown from seeds and from cuttings. In India the fleshy part

of the flower, surrounding the base of the trumpet, serves as a vegetable for curries and soups.—On waste land, as on fields near the end of Kalakaua Avenue joining King Street; on trail near top of Tantalus.

Leaves.—Cordate to hastate, entire, angular or 3-lobed, long pointed, smooth, auricles rounded, 3-8 inches long; stems 4-6 inches long. *Flowers*.—Equalling the petioles in length, pedicels 1/2-1 inch long, peduncles 2-7 inches long, 1-7 flowered. *Calyx*.—Sepals papery, unequal; the 2 interior oval-oblong, obtuse, 3 exterior oval-lanceolate, running into long filiform points, 3/4 inch long. *Corolla*.—Trumpet shaped, pure-white, some with greenish plaits, fragrant, 3-6 by 4-6 inches *Stamens*.—Exserted; anthers linear, finally twisted. *Fruit*.—Smooth seeds. *Home*.—Probably India (Hillebrand); tropical America (Kew Index).

Ceylon morning-glory, wood rose, Spanish arbor vine (*Ipomoea tuberosa* Linnaeus). Figure 57, *d*.—A vigorous West Indian vine with leaves divided deeply into seven pointed lobes and with pretty, bright orange-yellow flowers, the Ceylon morning-glory, is climbing on fences here and there in Honolulu. The flowers, which are funnel-shaped and not divided into lobes, develop into an odd and attractive feature of the plant, a tan and brown seed case, which consists of what appear to be five woody petals rolled back from a central budlike ball. Clusters of these seed cases (sometimes called "frozen roses") take the place of floral decorations.

Prince's vine, Kuhio vine (*Ipomoea horsfalliae* Hooker). Figure 57, *c*.—The prince's vine is tall and branching and makes an excellent covering for trellises. With its showy, crimson, bell-shaped flowers it adds a brilliant mass of color to gardens in fall and late winter, when a single vine bears hundreds of new flowers each day. It is found throughout the Tropics, and in Honolulu, where it is well liked, it bears Prince Kuhio's name, as he had a plant on his place at Waikiki. In temperate climates, it is perhaps the most popular ipomoea for winter flowering in hothouses, where it will climb 20 to 30 feet high.—Sacred Heart Church, Wilder Avenue; 2447 Parker Street; Thurston Avenue near Wilder Avenue.

Leaves.—Evergreen, 5-lobed, some 6 or 7-lobed; segments lanceolate, entire, tapering almost equally at both ends, margins wavy; petioles rather long. *Flowers*.—Many, showy, in 2-branched cluster; peduncles axillary and about as long as petioles. *Calyx*.—Roundish-oval, blunt lobes, 5, purple-black, overlapping. *Corolla*.—Bell shaped, rose-red, glossy, limb of 5 broad, rounded, notched lobes. *Stamens*.—Longer than tube, 5. *Pistil*.—Stigma capitate, 2-lobed, hairy. *Home*.—Eastern India.

Beach morning-glory, pohuehue (*Ipomoea pes-caprae* Swartz). Figure 57, *f*.—A morning-glory that is a vigorous vine commonly seen creeping on sandy beaches just above high-water mark in many tropical countries has runners several yards long. It is a smooth, green plant, and it roots at the joints. The main root is long, one being found 12 feet long and 2 inches thick. The thick leaves, notched at the tip, are heart-shaped, or shaped like a goat's foot, explaining *pes-caprae* in the scientific name. Some are broader than long, and the two lobes are partly folded up along the mid-vein. The dusky-pink, bell-shaped flowers bloom singly or a few in a cluster, the greatest numbers appearing in the morning. They form a capsule containing downy seeds, which have some medicinal value.—Beach near Ocean View Court, Waikiki.

Hawaiians use the vines for driving fish into nets, and formerly they whipped the sea with them when they wished to have high waves for surf-riding. Hence the saying, "Smite the waves with *pohuehue*, and the waves will break." The following has been recorded by Fornander:

Arise, arise, ye great surfs from Kahiki,
The powerful curling waves.
Arise with the *pohuehue*,
Well up, long raging surf.

Leaves.—Oval or round, 1-4 by 2-3 inches, notched at tip and divided into two lobes, rather thick, veins oblique and nearly parallel, folded part way, alternate, two glands at base; stems 2 inches long or more. *Flowers*.—One or a few in a cluster, stem 1/2-1 inch long. *Calyx*.—Obtuse, oval sepals, about 1/3 inch long, inner ones longer. *Corolla*.—Dusky pink, 1 1/2-2 inches long, scarcely lobed, bell-shaped, gradually tapering to the base. *Pistil*.—Stigma 2-lobed. *Fruit*.—A 2-celled capsule, oval, 1/2 inch long, seeds downy. *Home*.—Tropics.

Cypress vine, Indian pink (*Ipomoea quamoclit* Linnaeus). Figure 57, *e*.—The smooth, slender cypress vine seen here and there in gardens in Honolulu may climb as high as 20 feet. Both flowers and leaves are beautiful, the leaves also being odd—composed of several threadlike divisions. The conspicuous trumpet-shaped flowers are scarlet; those of a variety are white.—Grounds of University of Hawaii.

Leaves.—Pinnate, divided into many threadlike segments; short stemmed or sessile. *Flowers*.—Peduncles ordinarily longer than petioles, few-flowered. *Calyx*.—Sepals 5. *Corolla*.—Scarlet (white in a variety), 1-1 1/2 inches long, tube narrowly funnel shaped, inflated above; limb nearly flat, 5-lobed. *Fruit*.—Dry capsule. *Home*.—Tropical America.

Convolvulus, morning-glory (*Ipomoea* species).—A rather common morning-glory in Honolulu climbs vigorously on fences and trellises and bears flowers in profusion. They are possibly one or more Japanese species.

Some bush morning-glories are also grown in gardens.

Morning-glories are especially popular in Polynesian myth. In Samoa they are called "sacred" or "peopling vines." For when Tangaloa, the creator, came to prepare islands for the Samoans, he placed a convolvulus vine in the sun, and its juice produced worms, which he fashioned into people and endowed with intelligence. Hawaiian legends tell of the use of the vine as rope. Turi, "the man of a thousands deeds," is a Polynesian hero who snared a mischievous elf with convolvulus vine. The elf was so old that in many places his skin was repaired with coconut shell. The French call the morning-glory "the bell of the day."

Dodder, kaunaoa, pololo (*Cuscuta sandwicheana* Choisy).—On the outskirts of Honolulu may be seen here and there on roadsides and in uncultivated fields network patches of the slender, yellow stems of the dodder. Though it begins life with a root in the ground, this degenerate plant soon attaches itself by sucker-like roots to another kind of plant, such as the *pohuchue*, and becomes a parasite. It sucks the life juices of its host plants so greedily that many of them die. If it finds no green herb or vine to support it, the dodder itself dies. Flowers and seeds are small, and leaves are absent. The *kaunaoa* or dodder is the plant of Lanai. In the old literature of Hawaii it was often called "the motherless plant" because it is a parasite. "Kaunaoa vine, vine of Mana: how I love that orphan vine," is a proverb applied to a loved individual who has no home or family. —By roads and in open waste land near Honolulu.

Leaves.—Wanting. *Flowers*.—White or pink, small, in compound, open clusters; stems 1/4 inch long, stems of individual flowers much shorter and bearing a scaly bract at the top. *Calyx*.—Thin, dry, shining, bell shaped, 1/12 inch long, deeply 5-cleft, lobes rather acute, some dotted with glands. *Corolla*.—Yellow or reddish, 1/6 inch long, urn shaped, 5-cleft to middle, lobes somewhat acute or inflected at tip, erect or bent back, finally joined to capsule, some

dotted with glands. *Stamens*.—Anthers ovoid, nearly sessile below the sinus. *Pistil*.—Styles 2, distinct, unequal, exserted; stigmas enlarged and rounded, ovary 2-celled and 4-ovuled. *Fruit*.—Capsule round, nearly 1/6 inch in diameter, indehiscent but with small aperture within the style; seeds 1/12 inch in diameter, warty or with a network pattern, angular-convex or depressed-round, falling from capsule. *Home*.—Hawaii.

HELIOTROPE FAMILY

(Boraginaceae)

Kou (*Cordia subcordata* Lamarck). Figure 58, *a*.—The *kou* played an important part in the life of the early Hawaiians, for from its soft but lasting wood were made cups, dishes, and calabashes, beautiful with rippling dark and light lines and bands. Because of its broad crown it was also a favorite shade tree, being planted around houses and by the seashore. In spring, short clusters of bright-orange flowers add to its attractiveness. As it has never been found growing wild in the woods and has a wide distribution—from Hawaii to Madagascar, commonest in islands of the Indian Ocean—it is not native; seeds were probably brought to Hawaii by early immigrants. A medium-sized tree (few higher than 30 feet) with a short trunk and a diameter of not more than 2 feet, it grows quickly and easily; but a moth has tolled its death knell, having exterminated all but a few trees.—Lawn of Kawaiahao Church; Punahou campus.

In Tuamotuan mythology the *kou* was one of the first trees created.

In Hawaii, at Ewa, Oahu, an unrecorded legend tells of a chiefess who saw an old woman stringing a lei of *kou* blossoms. In a teasing mood the girl said, "Let me have the lei." The old woman answered angrily, "Youth is asking the old lady for the lei. Go and get flowers, and make yourself a lei." The chiefess bathed and returned and asked again for the lei. She received an angrier reply. She bathed again and sat on the beach, letting her beautiful black hair hang in the water, and asked yet another time for the lei. Now the old woman was a kahuna, and she caused sharks to materialize. The sharks called out, "Her hair hangs in the water! What shall we do with her?" "Whatever you wish," replied the old woman. The sharks ate the girl and scattered her blood over the bank, where to this day the soil is red. And to this day no one wears *kou* flowers in that section of Ewa.

In Tongan legend when Maui brought fire from the underworld and a downpour of rain was about to extinguish it, he told fire to flee into the coconut, the breadfruit, and the *kou*.

Leaves.—Oval or somewhat heart-shaped, 4-6 by 3 1/2-4 inches, on stems 1-1 1/2 inches long, tip sharp, entire, some wavy, smooth except for hairy spots in the axils of the main veins, fine network of veins. *Flowers*.—Bright-orange, in short terminal or lateral cymes, branching on one side, short-stemmed. *Calyx*.—Leathery, irregularly and shallowly 3 to 5 toothed, 1/2 inch long, broadly tubular, smooth outside, hairy within. *Corolla*.—Bell-shaped, orange, 1-1 1/2 inches in diameter, 5 to 7 rounded overlapping lobes, 1 external. *Stamens*.—Exserted, 6. *Fruit*.—Drupe, oval, contracted at top, about 1 inch long, enclosed in calyx; hard, black nuts with edible kernel. *Home*.—Asia and tropical Australia.

Cordia (*Cordia myxa* Linnaeus).—A rather large cordia differs from the *kou* in having smaller leaves, white or yellowish-white flowers, which bloom in early spring. The fruit, pink to cream colored, is mucilaginous and in parts of tropical Asia is used to cure coughs, a use to which the leaves are also put in Ceylon. This cordia grows well, especially in dry regions, from lowlands to elevations of 2,000 feet, and if in places where this tree is growing an expert in fire-making finds himself in need of matches he is not helpless, for one of the best woods for kindling fire by friction is at hand.—Nuuanu Pali road, by watering place near Dr. Morgan's house.



FIGURE 58.—Heliotrope family: *a*, *kou* (*Cordia subcordata*), leaf, flowers, fruit; *b*, clammy cherry (*Cordia collococca*), leaf and fruit.

Leaves.—Oval or elliptical, entire or more or less coarsely toothed in upper half, margin wavy, 2-4 inches long, acute at base, obtuse or subacute at apex, smooth on both sides, thick and hard, somewhat 3-veined at base; stem $3/4-1\frac{1}{4}$ inches long, slender. *Flowers*.—White or yellowish-white, small, stemless, in loose axillary corymbs, flowers shortly pedicellate; buds downy. *Calyx*.—Tubular-campanulate, smooth, downy within, segments shallow. *Corolla*.—Lobes oblong, obtuse, curved back. *Fruit*.—Drupe, pink to cream colored, fleshy, oval, $1/2$ inch long, smooth, pointed, lower half embedded in calyx, 5-10 lobed, longitudinally striate, mucilaginous. *Home*.—India, Malaysia, tropical Australia.

Foreign kou, geiger tree (*Cordia sebestena* Linnaeus).—The foreign *kou* grows as a shrub or small tree from cuttings and from fresh seeds. In Honolulu it is rare. Its most striking features are rough, dark-green, oval leaves, clusters of brilliant scarlet flowers, and white fruit.—Magellan Street, opposite Dole Park; Emerson Street, opposite Normal School.

Leaves.—Broadly ovate, subcordate, rough on upper surface and slightly downy beneath, dark-green, many about 2 or 3 inches long. *Flowers*.—In terminal cymes, orange or scarlet. *Calyx*.—Tubular, greenish, downy, shortly 3-lobed. *Corolla*.—Tubular, with 5-12 spreading wrinkled lobes. *Stamens*.—5-12. *Pistil*.—Style 2-lobed. *Fruit*.—White berry, enclosed in husk formed by persistent calyx, 4-loculed. *Home*.—Tropical America.

Clammy cherry (*Cordia collococca* Linnaeus). Figure 58, *b*.—The clammy cherry, from Jamaica, is a low tree with extremely long, drooping branches that can be seen in Honolulu in a few places. They are conspicuous on Ward Street, near King. The leaves look much like those of the *kou*. The short-stemmed, purple-to-white flowers grow in clusters. The pinkish fruit resembles cherries in size and shape, size of pulp and pit, but differs outside in being tipped with a point, inside in having a remarkably thick, insipid, sticky pulp.

Tree heliotrope (*Tournefortia argentea* Linnaeus).—A small, beautiful tree, few of which ever exceed 20 feet in height, grows here and there in Honolulu. It is a widely distributed tree on sea-shores in the Pacific and is especially common on coral islands. According to Tuamotuan mythology this was one of the first trees created.

The bark is deeply furrowed and pale. The leaves are clustered at the ends of branches, are oval, thick, and large, and are covered with a silky, whitish down. From small, white flowers in silky, spreading bunches at the ends of branches develops fruit resem-

bling a small, pointed, flattened pea.—Japanese School on Young Street; 1216 Young Street.

Leaves.—Oval, tapering at base, rounded at apex, terminal, many together, alternate, fleshy, 4-8 inches long, covered with silky, whitish down; stem short, stout. *Flowers*.—White, many, sessile, in large, terminal, silky, downy-stemmed cymes, spreading, long-branched; buds round. *Calyx*.—Sepals ovate-rotundate, overlapping, densely silky-hairy. *Corolla*.—Wheel shaped, 1/4 inch or more in diameter, lobes round and spreading. *Stamens*.—Anthers sessile, large, at throat of corolla. *Fruit*.—Size of a small pea, minutely pointed, rounded, flattened, smooth, brown, with a small corklike nut. *Home*.—India, Malaysia, Australia.

VERBENA FAMILY

(Verbenaceae)

Verbena, vervain, oi (*Verbena litoralis* Von Humboldt, Bonpland, and Kunth).—A common vervain from tropical America was brought to Hawaii many years ago. It lives on roadsides as a weed and has ruined some pasture lands, where it grows rankly as tall as six feet. The stem is square; the leaves are paired, broadly lance shaped, and toothed. This vervain is much like *Stachytarpheta dichotoma*, but is more bushy and more slender, has smaller leaves and flowers, and produces four instead of two nutlets.

Verbena, vervain, oi (*Stachytarpheta dichotoma* Vahl or *S. jamaicensis* Gardner). Figure 59, d.—A common weed long established in Hawaii is called *oi* by the Hawaiians. On ranches and agricultural lands it grows luxuriantly to a height of about four feet and is a pest. Smaller plants are common on roadsides. A downy stem bears angular branches and oval, hairy leaves and terminates in a long, slender spike, on which many tiny, deep-blue flowers open in succession. *Stachytarpheta* is Greek for "dense spike."—On country roadsides.

Leaves.—About 3 inches long, ovate, acuminate, crenate-serrate, hairy or downy, paired, abruptly contracting to short petiole. *Flowers*.—Long, slender spikes, on which many solitary flowers, accompanied by awl-shaped bracts, are sessile or half sunk. *Calyx*.—Tubular, about 1/4 inch long, with 4 short teeth. *Corolla*.—With curved tube and short 5-lobed limb, about as long as calyx, deep-blue. *Stamens*.—Included, only 2 fertile. *Pistil*.—Stigma swollen. *Fruit*.—Two linear nutlets, fruiting calyx partly immersed in spike. *Home*.—Tropical America.

Lantana, lakana (*Lantana camara* Linnaeus). Figure 59, *a*.—In some greenhouses in the United States the lantana is popular because it can be made to flower almost continuously. In Hawaii, where it was originally brought for gardens, it grows wild by roadsides and in waste places and has become a pest, so that parasites have been introduced to control it. These consist of eight insects brought in 1902 from Mexico, and they attack several parts of the plant: seeds, flowers, stems, or leaves. Though not particular about soil or amount of rain, the lantana requires a temperature above 40 degrees. In Ceylon it is said to be the commonest weed. It is a spiny shrub, one to four feet high if cultivated, as much as ten feet high if wild. At the base of small, thick, pungent-smelling leaves, which are rough on top and downy beneath, dense, flat-topped heads of small flowers grow on strong stems. The flowers seem variegated, for they ordinarily open yellow or pink and change to orange or scarlet.—In waste places and on roadsides, as on Round Top.

Leaves.—Ovate or heart shaped, rather thick, rough above, downy beneath, mostly short pointed, fine toothed; stems short. *Flowers*.—Small, in flat-topped clusters on strong axillary peduncles, which may exceed leaves, opening yellow or pink and changing to orange or red. *Calyx*.—Very small. *Corolla*.—A slender tube, spreading out in 4 or 5 lobes. *Stamens*.—Four, 2 long, 2 short. *Home*.—Tropical America.

Petraea, sandpaper vine, purple wreath (*Petraea volubilis* Linnaeus). Figure 59, *c*.—The petraea, one of the most striking and beautiful of climbing shrubs, is rare in most countries. In Honolulu it is popular and quite abundant. The leaves are oval or oblong, rough like sandpaper, and gray-green. Flowers bloom for a long period at least twice a year, some in February, and they grow in sprays of two dozen or so, beginning to open at the base of the cluster. A bluish-lavender, five-pointed star spreads wide open and remains on the vine long after the darker, violet-colored central part falls.—Corner of King and Piikoi streets; grounds of Central Union Church; Makiki Valley, nursery of Board of Agriculture and Forestry.

Leaves.—Ovate or elliptical or oblong, pointed or obtuse, entire, some with wavy margins, rough, gray-green, 3-4 inches long, short stemmed. *Flowers*.—In racemes 7-8 inches long, perhaps 2 dozen flowers, beginning to open at base. *Calyx*.—Lilac, flat star with 5 narrow lobes, persistent. *Corolla*.—In bud after calyx opens, violet, falling long before calyx. *Stamens*.—Four, in pairs of unequal length. *Fruit*.—Drupe with 2 cells, each with 1 seed. *Home*.—Cuba to Brazil.

FIGURE 59.—Verbena family: *a*, lantana (*Lantana camara*), leaves, flowering head, young and ripe fruit; *b*, duranta (*Duranta repens*), leaves, flowers, fruit; *c*, petraea (*Petraea volubilis*), leaves and flowers; *d*, verbena (*Stachytarpheta jamaicensis*), leaves and flowers; *e*, clerodendron (*Clerodendron squamatum*), leaf and flowers; *f*, bleeding heart (*Clerodendron thomsonae*), leaf and flowers.



Duranta, golden dewdrop (*Duranta repens* Linnaeus). Figure 59, *b*.—In some places duranta shrubs reach a height of ten feet. They are widely cultivated in the Tropics, and in Hawaii they are used in hedges and on lawns. They are especially attractive when loaded with masses of fruit—small, orange berries, which cling to the slender, drooping branches of the plant for several months. The bark is smooth, the branches hairy and ash-colored. The leaves are oval and have toothed margins in the upper half. Tiny blue or white flowers grow clustered mostly on one side of the stem in dainty sprays.—2030 Nuuanu Avenue; grounds of Pacific Club; grounds of Territorial Office Building.

Leaves.—Opposite or whorled, obovate to elliptical, narrowing towards base and tip, upper half with toothed margins. *Flowers*.—Blue or white, short stemmed, small, in racemes, mostly on 1 side of the stem. *Calyx*.—Persistent. *Corolla*.—Limb of 5 spreading lobes, pale-blue with 2 purple streaks down the middle of the 2 smaller and narrower lobes; some white. *Stamens*.—Four, in unequal pairs. *Fruit*.—Small, oval, yellow berries, persisting for several months. *Home*.—Tropical America.

Teak (*Tectona grandis* Linnaeus).—The teak is a large tree, which grows tall and straight to a height of 100 to 150 feet and attains a circumference of 10 to 15 feet. Some trees live to be 200 years old, though they are mature at 80 years. Some are buttressed at the base. Natural forests, such as grow in Burma up to an elevation of 4,000 feet, are not pure teak but a mixture of bamboos and other kinds of trees. However, an acre may contain 60 trees, which will yield about 3,000 cubic feet of timber for the market. Next to mahogany, teakwood has the highest price.

The trees develop more rapidly from shoots than from seeds (5 to 10 feet in two years) and in comparatively few years reach their full height, increasing in diameter more slowly. As when green the wood sinks in water, trees are ordinarily girdled and allowed to stand for a year or two before cutting. Because the timber is valued highly for buildings, ships, bridges, sleepers, furniture, railroad cars, decks, lower masts, and for backing armor plates on ironclads, an important trade is carried on in it. If seasoned, the wood does not crack, split, or change shape, and is perhaps the most valuable kind known for timber, especially in the Tropics. Termites do not eat it; but boring mollusks around piers do. When dry the wood is not very

heavy, is fairly hard and very strong. It is brown with mottled streaks and is fragrant for a long time. It is valued chiefly for its durability, for which it is famous. It is said that teak woodwork put up at Poona 2,000 years ago is still perfectly good.

Besides timber, other products come from the wood. A white concretion of calcium carbonate in its cracks and crevices is used as a substitute for lime by natives of southern India; black tar comes from the distilled wood; the powdered wood serves in India as a plaster for headaches and swellings, internally for dyspepsia. The bark is astringent.

The spreading crown of the teak tree bears quadrangular branchlets, to which huge oval leaves are attached. These fall annually. They yield a red or yellow dye, and if a place is scratched and then moistened with saliva, it turns red. In India, natives use the leaves for plates, for packing, and for thatching. From the many small flowers, which appear in clusters at the ends of branches, small seeds develop, which yield an oil, though it is with difficulty extracted. This is good medicinally, being used to stop itching and to make hair grow.—Home for children, Nuuanu Avenue near School Street; corner Emerson and Prospect streets.

Leaves.—Large, 1-2 feet by 6-12 inches, larger on shoots, opposite, whorled in juvenile specimens, hard, rough, ovate, pointed. *Flowers*.—Small, white, numerous, on large, erect, cross-branched terminal panicles. *Fruit*.—Bony nut, 1-4 celled, surrounded by a thick covering (a dense felt of matted hairs), which is enclosed in enlarged membranous calyx; seeds small, oily, ripening in 6 months. *Home*.—India and some islands in the Indian and Malayan archipelagoes.

Clerodendron (*Clerodendron squamatum* Vahl). Figure 59, *e*.—On several lawns in Honolulu the attractive shrub, clerodendron, is conspicuous when it is time for its large loose head of small brilliant-scarlet flowers to bloom, in the spring and summer. After flowering, berries develop that become blue-black. The shrub grows to a height of six to ten feet. Stem and branches are covered with down.—Near Bishop Hall of Science, Punahou, Punahou Street; 2150 Lanihuli Drive.

Leaves.—Opposite, round heart shaped, abruptly pointed. *Flowers*.—Scarlet, in loose clusters. *Calyx*.—Small, red, 5-lobed. *Corolla*.—Lobes 5-parted, reflexed, spreading, unequal, tube slender and cylindrical. *Stamens*.—Affixed

on corolla tube, 4, long exserted, curved. *Pistil*.—Style exserted, 2-cleft at end. *Fruit*.—Blue-black berries, 4-loculed, enclosed in calyx. *Home*.—India and China.

Bleeding heart (*Clerodendron thomsonae* Balfour). Figure 59, f.—The bleeding heart is a tall, smooth, twining plant with oblong or oval leaves, which are prominently veined. When blooming it is strikingly beautiful with masses of peculiar flowers. These are red and white. From a whitish cup shape extends a slender red tube, which ends in five spreading red lobes.—2333 Liloa Rise.

According to legend, a maiden's sweetheart deserted her, and she wept bitterly. The lover returned; but the maiden was not to be found, and where her tears had fallen a plant had sprung up bearing blossoms that were bleeding hearts.

Leaves.—Opposite, oblong-ovate and pointed, with several prominent veins. *Flowers*.—In axillary and terminal forking panicles, blooming profusely on young wood. *Calyx*.—Whitish, strongly angled, narrow at apex, 5-lobed. *Corolla*.—Red, spreading, with slender cylindrical tube, 5-parted. *Stamens*.—affixed on corolla tube, 4, long exserted and curved. *Pistil*.—Style exserted, 2-cleft. *Fruit*.—Drupe enclosed in calyx. *Home*.—Tropical Africa.

Clerodendron (*Clerodendron fragrans* Ventenat).—A clerodendron growing wild on the outskirts of Honolulu as a roadside weed and around deserted homes blossoms somewhat like a hydrangea, the white or pale-pink flowers growing in rounded clusters from the ends of branches. Although both the leaves, which are large and broad, and the flowers have a rather unpleasant odor, the plant is considered desirable for cultivation in greenhouses in the United States. It was brought to Hawaii many years ago. This clerodendron is somewhat shrubby, reaches a height of three to five feet in some countries but only about two feet in Hawaii, and has downy stems and angled branches. New plants develop from underground stems.—On roadsides, upper Manoa Valley.

Leaves.—Broadly ovate, base truncate or lobed, short pointed, margin undulating and coarsely toothed, ill scented, bristly above, downy beneath; stems long, bearing scattered glands. *Flowers*.—White or pale-pink, in terminal, contracted, compact, subsessile, hydrangea-like bunches, ill scented, most double. *Calyx*.—Lobes 5-cleft, acute. *Corolla*.—Lobes obovate, obtuse, 5; tube little longer, if at all, than the large calyx. *Stamens*.—Four. *Pistil*.—Style with 2 acute stigma lobes. *Fruit*.—A drupe, kernel ordinarily large and separating into 2-4 nuts. *Home*.—China, Sumatra, Java.

Coleus (*Coleus blumei*). Mint family. See page 311.

POTATO FAMILY
(Solanaceae)

Akulikuli, ohelo kai, aeae (*Lycium sandwicense*). See page 311.

Poha, cape gooseberry, husk tomato, ground cherry (*Physalis peruviana* Linnaeus). Figure 60, *d*.—The poha grows wild in many countries, though it is believed to come from America. In warm places it is a perennial herb, in cold places an annual. In Hawaii, where it is common on open mountain slopes, it grows best between 1,500 and 4,000 feet. The fuzzy, oval or heart-shaped leaves grow in pairs on a stem one and a half feet high or more. When the inner, yellow, bell-shaped flower part drops, the outer bell-shaped flower part enlarges and finally encloses in a tan-colored paper sack a small, edible, tomato-like fruit. A thin, orange skin covers a sweet, juicy, many-seeded pulp. The fruit is eaten raw and cooked, and the preparation and sale of jam and jelly from it is considerable in Honolulu.—In some gardens; wild in fields.

Leaves.—Ovate or heart-shaped, long-pointed, edges wavy, opposite, fuzzy, 2-3 by 1 3/4-2 inches; stems 1/2-1 inch long. *Flowers*.—Open bell shaped, yellow; stem 1/3-1/2 inch long. *Calyx*.—Downy, bell shaped, cut into 5 sharp lobes 1/3 inch long in flower and up to 2 inches long in fruit, bluntly keeled, inflated. *Corolla*.—Bell shaped, 1/2 inch long, 5-angled, yellow with 5 purple spots inside. *Stamens*.—Five, anthers purple. *Fruit*.—Enclosed in calyx, which has become a thin, green, or, when dry, tan-colored, papery, hairy pointed case; round, about 1/2 inch in diameter, tomato-like, orange, juicy, edible; pulp sweet and slightly acid, containing many small seeds. *Home*.—Brazil.

Chili pepper, red pepper, goat pepper, spur pepper (*Capsicum frutescens* Linnaeus). Figure 60, *a*.—When heavily loaded with its bright-red pods the chili peper is quite ornamental, even if growing on roadsides or among refuse. The juiceless and many-seeded pod-like fruits are ground to a powder, which is the red or Cayenne pepper of commerce. In southern United States, where the fruit has time to ripen, plants are cultivated for this purpose. They are shrubby, live from year to year, and reach a height of three to six feet. The stem and spreading or trailing branches are angled or channeled.—On roadsides and on waste land.

Other species of capsicum are growing in Hawaii, and one variety of this species (*baccatum*), from tropical America, has smaller fruit that is oval or nearly round and about a quarter of an inch in diameter, smaller flowers, and stems that are more nearly erect but shorter.



FIGURE 60.—Potato family: a, chili pepper (*Capsicum frutescens*), leaves and fruit; b, angel's trumpet (*Datura arborea*), leaf and flower; c, Chinese inkberry (*Cestrum nocturnum*), leaves and flowers; d, poha (*Physalis peruviana*), leaves, flower, fruit.

Leaves.—Broadly ovate, pointed, 3-6 by 2-3 1/2 inches. *Flowers*.—Whitish; peduncles slender, 1-2 inches long, many paired. *Calyx*.—Cup shaped, embracing base of fruit. *Corolla*.—Rotate, commonly with ochraceous markings in throat. *Stamens*.—Five to 7, alternating with corolla lobes, anthers bluish. *Fruit*.—Red, obtuse or oblong acuminate, 1/4-3/4 inch in diameter, very acrid, juiceless, the podlike covering containing many seeds. *Home*.—Tropical America.

Potato vine (*Solanum wendlandii* Hooker). Figure 61, *a*.—A tall vine with slightly thorny leaves and stems, the leaves of various sizes and shapes—oblong and undivided to several-lobed—the potato vine, is well suited to adorn stonewalls and arbors. The flowers are attractive, and when blooming in crowded clusters, as happens especially in early summer and in fall, they make a striking display that lasts for weeks. In California they bloom twice a year, and there the vine is considered by some as the showiest in the State.—Hastings Street near Makiki Street; sometimes in pots in Academy of Arts.

Leaves.—Various, some 10 inches long, upper simple and oblong-acuminate, others lobed or trifoliate, with terminal leaflet much the largest, margins entire, alternate, prickly; stems prickly. *Flowers*.—Pale-blue, 1 1/2-2 1/2 inches in diameter, shallow lobed, in large, many-flowered cymes. *Fruit*.—Round berry. *Home*.—Costa Rica.

Potato tree (*Solanum macrophyllum* Hortorum). Figure 61, *b*.—In temperate America that diverse genus, *Solanum*, which is said to include nearly a thousand species, is represented by herbs, in tropical America by many shrubs and small trees. Among the last is the potato tree, rather rare in Honolulu, a small to medium-sized tree with downy stems armed with curved spines. The leaves are lobed, wavy, and very large. Its clusters of large, blue, yellow-centered flowers fade to whitish and finally develop into yellow berries.—Makiki Valley, nursery of Board of Agriculture and Forestry.

Leaves.—A foot long or more, quite broad, alternate, unequal at subcordate base, sinuate lobed, the lobes oblong-lanceolate, acute, margins undulating; petioles about 1 inch long, forming a wing along the stem. *Flowers*.—Racemose, opposite the leaves. *Calyx*.—Lobes with a long slender point. *Corolla*.—Large, blue, marked with yellow in center. *Stamens*.—Inserted on throat of corolla. *Fruit*.—Round, yellow berry about 3/8 inch in diameter. *Home*.—Mexico.

Datura, angel's trumpet (*Datura arborea* Linnaeus). Figure 60, *b*.—The angel's trumpet, a small tree or shrub, gained its common name from the large white trumpet-shaped flowers that hang vertically

from its branches in large numbers during the summer. Though they are pleasing to see, their musky odor, which is said to increase at night, is hardly pleasing to smell. The flowers are poisonous to eat, as are also the oval, downy leaves. In fact, the whole plant contains a strong narcotic. Perhaps this unpleasant feature explains the rarity of the plant in Honolulu, where formerly it was a common ornamental shrub. Locally it is called "belladonna," a name rightfully belonging to an entirely different plant not known in Hawaii.—Grounds of Territorial Office Building; Dr. Morgan's place, beside Nuuanu Pali road.



FIGURE 61.—Potato family: *a*, potato vine (*Solanum wendlandii*), leaf, flower, buds; *b*, potato tree (*Solanum macrophyllum*), leaf, new and old flowers.

Leaves.—Ovate, pointed, downy; in pairs, 1 a third shorter than the other; stem 1 inch long or more. *Flowers*.—Large, white, pendulous, trumpet shaped, musky smelling. *Calyx*.—Tubular, pointed, like a single leaf, not toothed. *Corolla*.—Tube nearly cylindrical, long; limb long, 5-toothed, twisted in bud. *Stamens*.—Alternating with lobes of corolla, anthers distinct. *Home*.—Peru and Chile.

Jamestown weed, jimson weed, jimson weed, thorn apple, kikania-haole (*Datura stramonium* Linnaeus).—In many parts of the world a poisonous plant, the jimson weed, can be seen both in gardens and as an escape by roads and in fields. It is a large, coarse, ill-smelling herb with stout roots, smooth, green, hollow stems, large leaves, and large, erect, white, trumpet-shaped flowers, some of which are double. The fruit, a spiny capsule or "thorn apple," contains many seeds. History says that in 1676 soldiers sent to quell a rebellion in Jamestown, Virginia, gathered young jimson weeds, cooked them, and ate them. The results were curious, for during the next eleven days the men acted insane. Then they became normal again. According to Bailey "it is conjectured that priests at Delhi used the plant to produce oracular ravings." As a matter of fact, the plant is poisonous to man and beast, being strongly narcotic, especially the seeds. Both seeds and dried leaves have medicinal value, several thousand pounds of them being used yearly in the United States in medicine.—Waste land.

The following Zuni legend is told of the jimson weed. A boy and girl often came from the interior of the earth, where they lived, and visited the outer world, and upon their return they told their mother everything they had seen and heard. This so annoyed the divine ones, who thought the children knew too much, that they caused the earth to close over them forever. Where the children had ascended to the outer world white flowers like those they had worn sprang up. Today the Zunis call the flower *aneglakya*, which was the name of the boy.

Leaves.—Alternate, ovate, irregularly cut or toothed, 3-8 inches long, dark-green above, light-green below; petioles large. *Flowers*.—Erect, solitary on short stems in forks of branches. *Calyx*.—Half as long as corolla, 5-toothed. *Corolla*.—White, trumpet shaped, 2-4 inches long, about 2 inches wide at mouth, 5-lobed. *Stamens*.—Five; filaments attached to inside of corolla tube a little below middle. *Fruit*.—Capsule spiny, rapidly developing, 4-celled, ovoid, 2 inches long, splits open at top to let out seeds, which are shaken out gradually by wind or passing animals; seeds many, containing concentrated poison, dark-brown, wrinkled and pitted. *Home*.—Cosmopolitan in temperate and tropical regions.

Datura (*Datura fatuosa* Linnaeus).—From the Tropics of the Eastern Hemisphere comes a datura popularly known as "cornucopia" or "horn of plenty." Its flowers seem to consist of two or three nested trumpets. As one plant bears 200 to 300 flowers a season that range in color from white to cream to violet to car-

mine, it is highly ornamental. But it is not common in Honolulu. Sometimes one can be seen in a court at the Academy of Arts.

Golden cup (*Solandra guttata* D. Don).—A high, sturdy, woody climber, one of the most attractive for fences and arbors, and a beautiful flowering plant blooming best in January, February, and March, is the golden cup. The yellow, goblet-shaped flowers, which are borne singly, are remarkably large, and their odor is delicate and pleasing. They have five lobes that overlap in bud and incline to curl back when the flower opens—an interesting process that can be watched if a bud is picked at a late stage and placed in a vase in the house. Long, shining leaves add to the beauty of this plant.—Corner of Lunalilo and Pensacola streets; on Liloa Rise; Liliha Street above Judd; Makiki Valley, nursery of Board of Agriculture and Forestry.

Leaves.—Obovate-oblong, acute, smooth thick, simple, entire, shining. *Flowers*.—Fragrant, large, solitary. *Calyx*.—Long-tubular, 5-cleft. *Corolla*.—Funnel shaped, twice as long as calyx, yellowish, becoming darker, 5 broad, overlapping lobes, purple streaks in throat, short lived. *Stamens*.—Inserted on corolla tube, 5. *Fruit*.—Round, pulpy berry. *Home*.—Mexico.

Cestrum, Chinese inkberry (*Cestrum nocturnum* Linnaeus). Figure 60, c.—In Mexico a cestrum is liked more than any other plant for the fragrance of its flowers, which have a perfume that is faint in the day time and quite strong at night. It is a quick-growing shrub with brown, slender, flexible branches, growing as high as nine feet, and is common in Honolulu but is not conspicuous in appearance. The oval or elliptical leaves are small, as are also the yellowish or greenish flowers, which are most abundant in summer and fall. The clustered fruits—small, white berries—are numerous.—In several gardens.

Leaves.—Ovate or elliptic, prominently acuminate, alternate, entire, evergreen. *Flowers*.—Creamy-yellow or greenish-white, tubular, in clusters, small, fragrant (especially at night). *Fruit*.—Small, white berries. *Home*.—Tropical America.

Cestrum, Chinese inkberry (*Cestrum diurnum* Linnaeus).—A cestrum with thicker leaves than those of *C. nocturnum* also differs in having white flowers that are sweet-scented by day. The berries are black.—In some gardens.

Leaves.—Oblong, short-acute, thickish, smooth, shining above, alternate. *Flowers*.—White, sweet-scented (especially in day time), in long-peduncled axillary spikes, tubular. *Fruit*.—Black berries. *Home*.—West Indies.

Wild tobacco (*Nicotiana glauca* Graham).—Soon after its introduction to Hawaii, probably about 60 years ago, the wild tobacco spread to fields and roadsides, where it is common today. It is a smooth shrub or tree with a somewhat bluish color, growing eight feet high or more. Its flowers are clustered at the ends of stems and consist of yellow tubes one to two inches long, which after narrowing at the mouth spread out to form small lobes. Leaves are oval to heart shaped and about five inches long. This plant is at home in Argentina. In the United States it is cultivated in gardens, and in some parts runs wild.

The raising of tobacco (*N. tabacum*) for commercial purposes has not been successful in Hawaii.

Brunfelsia (*Brunfelsia* species).—The brunfelsia, a compact, slow-growing shrub, a few feet high, is conspicuous when bearing its attractive, fragrant, somewhat stiff-looking flowers, which change from blue-violet to whitish. A variety has white flowers. They blossom well some years in February and are said to do so most abundantly when the plant is pot bound.—2336 Liloa Rise; 2252 Metcalf Street.

Leaves.—Lance-oblong, alternate. *Flowers*.—Solitary or clustered, fragrant. *Calyx*.—Four or 5-parted. *Corolla*.—Lobes 5, rounded, spreading, nearly equal, bluish or purplish (variety white), tube whitish. *Stamens*.—In corolla throat. 4, anthers alike. *Fruit*.—Berry-like. *Home*.—Tropical America.



FIGURE 62.—Figwort family: coral flower (*Russelia juncea*), flower, buds, green seed cases.

FIGWORT FAMILY

(Scrophulariaceae)

Coral flower (*Russelia juncea* Zuccarini). Figure 62.—Like strings of firecrackers, the small bright-red blossoms of the coral flower nod on slender, green, angled stems of shrubby plants, which form low, drooping hedges on many lawns in Honolulu. As it grows easily and flowers continuously, this plant is also adapted to rockeries and to hanging baskets. Though not distinct, reduced leaves are present, two or more growing together on the branches. —2365 Oahu Avenue; corner of Vancouver Highway and Kaala Avenue; corner of Bates Street and Nuuanu Avenue.

Leaves.—Linear-lanceolate or ovate, small, becoming minute bracts on the branches, opposite or whorled. *Flowers*.—Bright-red, small, long and tubular, many; in loose, remotely flowered racemes, peduncles elongated. *Calyx*.—Five-parted. *Corolla*.—Cylindrical tube, lobes spreading and nearly equal. *Stamens*.—Four. *Fruit*.—Capsule, nearly round, 2-celled; seeds many, very small, winged. *Home*.—Mexico.

BIGONIA FAMILY

(Bignoniaceae)

Orange trumpet vine, huapala (*Bignonia venusta* Ker). Figure 63, a.—An early sign of spring is the orange trumpet vine with its curtain of dazzling-orange flowers that hang from trellises and arbors in January and February, some in March. As they ripen, the flowers have a curious way of dropping their long orange tubes, which are caught and held vertically for a period by the enlarged tip of the long, slender style. On the island of Madeira this vine is a favorite and is cultivated abundantly. In Hawaii superstitious people will not plant the *huapala* near the front of their houses, as in this location it is supposed to cause bad luck with their sweet-hearts.—2333 Liloa Rise.

Leaves.—Ordinarily 3 leaflets, smooth, oval, pointed, more or less tapering at base. *Flowers*.—Orange to crimson, in corymbose, mostly drooping racemes, profuse. *Corolla*.—Slender and long-tubular, 2-3 inches long, contracted in

lower half, limb 2-lipped and oblong; obtuse, reflexing lobes. *Stamens*.—Four perfect. *Fruit*.—Linear, compressed capsule; seeds winged. *Home*.—Brazil.

Cat's-claw climber, hug-me-tight (*Bignonia unguis-cati* Linnaeus). Figure 63, *b*.—By means of triple-clawed tendrils, a bignonia with bright-yellow flowers, which blossom in profusion probably twice a year in Honolulu, clambers up walls and trees in many parts of town. The vine is slender and has paired leaves, each consisting of a pair of small, thin, oval leaflets with wavy edges. It is grown from seeds or suckers.—Walls of Bishop Museum; 2447 Parker Street.

A very graceful bignonia (*Bignonia jasminoides*), with pale-purple flowers, is not very common in Honolulu, nor is a kind with pale-lavender flowers (*Bignonia regina*).

Leaves.—Evergreen, opposite, compound; leaflets 1 pair, lanceolate and pointed or somewhat heart shaped, 3 inches or less long, with 3-parted claw-like tendrils in place of end leaf. *Flowers*.—Trumpet shaped, 2 inches by 2 inches, like an *Allamanda*, 5-lobed, somewhat 2-lipped, orange-yellow, lobes rounded and spreading. *Stamens*.—Four. *Fruit*.—Said to be a 2-celled capsule, flattened, valves thickened; seeds winged. *Home*.—Tropical America.

Tecomaria [*Tecomaria capensis* (Thunberg) Fenzl vom Cap]. Figure 63, *c*.—As a low bush the glossy-leaved tecomaria grows in a straggling way, sending runners out over the ground and up supports. The showy scarlet flowers, borne in clusters at ends of branches, are wide tubes, each ending in five short, rounded lobes. The fruit, rarely seen, is a long, flattened capsule. For awhile rare on lawns in Honolulu, the tecomaria is becoming quite popular.—Top of Manoa hill, north side.

Leaves.—Pinnate; about 9 leaflets, paired except end one, serrate, shining. *Flowers*.—In terminal clusters, cup regular, bell shaped, 5-toothed, slightly bent, smooth. *Stamens*.—Mostly extending. *Fruit*.—Capsule, linear, compressed; seeds slightly winged. *Home*.—South Africa.

Jacaranda (*Jacaranda ovalifolia* R. Brown).—The jacaranda is considered one of the one hundred best flowering trees or shrubs for subtropical regions and is cultivated in many warm countries. The tree is fair sized in Hawaii, California, and northern New Zealand (50 feet high); in Florida it is said to be small (20 feet high). In Cairo it is a popular shade tree. During May and June its clustered pale-blue flowers are most abundant in Honolulu. But some may be found from January to August. At the height of the season

they fall in great numbers, thus laying a carpet that seems to reflect the beauty of the branches. From wide-spreading branches stretch graceful and elegantly fine leaves.—66 School Street; Punahou campus; park at corner of King and Keeaumoku streets; bordering Young Street, near Victoria; Emma Square.



FIGURE 63.—Bignonia family: a, trumpet vine (*Bignonia venusta*), leaves and flowers; b, cat's-claw climber (*Bignonia unguis-cati*), leaves and flower; c, tecomaria (*Tecomaria capensis*), leaf and flowers; d, catalpa (*Catalpa longissima*), leaves, flower, seed case.

Leaves.—Fine, graceful, fernlike, distant, spreading, bipinnate; 10 or more pairs of pinnae; 14-24 pairs of leaflets, about 1/4 inch long, oblong, hairy, paired, with odd leaflet at the end. *Flowers*.—Pale-blue, in terminal, loose cymes 8 inches high, composed of 40-90 flowers. *Calyx*.—Small. *Corolla*.—Bell-shaped, 2 inches long, 1 1/2 inches wide, 2-lipped with 1 lip 2-lobed, the other 3-lobed, more or less horizontal. *Stamens*.—Four perfect, 2 long, 2 short. *Fruit*.—Round, flat, 2-valved capsule; seeds light, winged. *Home*.—Brazil and Argentina.

Catalpa, yoke-wood (*Catalpa longissima* Sims). Figure 63, *d*.—The catalpa is both a useful and an ornamental tree. Especially in Cuba it is admired and is planted for show, and recently in Hawaii a few have been placed on lawns. The tree grows 50 feet high, bears bright-green, leathery, oblong leaves and large, showy clusters of small, white flowers. Some time after the blossoms fall, large numbers of curiously long, narrow seed cases hang from the branches. Though coarse grained and soft, the wood lasts well in soil and therefore serves well for railway ties and fence posts.—Grounds of Capitol, by Richards Street; University Street.

Leaves.—Deciduous, opposite or whorled, large, simple, oblong-ovate, leathery, bright-green, long stemmed. *Flowers*.—In large, showy panicles, small, white. *Calyx*.—Two-lipped. *Corolla*.—Tubular-campanulate, 2-lipped, with 2 smaller upper and 3 larger lower lobes. *Stamens*.—Two fertile. *Fruit*.—Very long, narrow, cylindrical capsule, separating into 2 valves, which become twisted; seeds many, small, oblong, compressed, bearing a tuft of white hairs on each end. *Home*.—West Indies.

Tecoma, yellow bignonia, robe amarillo (*Tecoma stans* Jussieu). Figure 64, *b*.—The yellow bignonia is a little-branched shrub about 12 feet high, with thick, pointed foliage. In large bunches at the ends of branches, showy yellow bells make the neighboring air fragrant in flowering time. Later, numerous narrow seed cases develop containing many flat, winged seeds. It is a popular shrub, for it has been a welcome introduction to many tropical countries.—Grounds of University of Hawaii, near upper tennis court.

Leaves.—About 8 inches long, odd-pinnate; leaflets 5-11, oblong, edges toothed, almost sessile, ovate to narrow-lanceolate, pointed, smooth, 1 1/2-4 inches long. *Flowers*.—In large terminal panicles, showy, yellow, fragrant. *Calyx*.—With 5 short teeth. *Corolla*.—Bell-shaped, about 2 inches long. *Stamens*.—Four, 2 long, 2 short. *Pistil*.—Style slender. *Fruit*.—Capsules, 5-7 by 1/3 inches, linear; seeds many, flat, with 2 large thin wings. *Home*.—Tropical America.

Tecoma, yellow bignonia tree (*Tecoma* species). Figure 64, *a*.—A beautiful tall tree on School Street, near Nuuanu Avenue, on the edge of the Hillebrand Gardens—a tecoma—is one of the most attractive trees in town when in flower. Its smooth, slender, gray trunk rises high in the air before branches begin. The long-stemmed leaves with their five leaflets unite to make an attractive canopy. They fall annually before flowering time and reappear with the last of the flowers. When the masses of bright-yellow blossoms crowd ends of branches they replace the green canopy with a beautiful yellow one. Mr. D. Howard Hitchcock, Mrs. Helen Dranga, and other artists have painted this tree. Judging from observations for four years the display lasts nearly two months, one year beginning March 3, another year March 24, a third year in June, and a fourth year in January. It is the only large tree of its kind known in Honolulu, and not until about 1922 were seeds found that would germinate. From these seeds young trees are now growing. Tropical America is the home of this tecoma.



FIGURE 64.—Bignonia family: *a*, tecoma (*Tecoma* sp.), leaf of young tree, flower of older tree; *b*, tecoma (*Tecoma stans*), leaf and flowers; *c*, flower of tulip tree (*Spathodea campanulata*).

Tulip tree, African tulip tree, fountain tree (*Spathodea campanulata* Beauvois). Figure 64, c.—A decidedly ornamental plant may be found in the sturdy tulip tree, which grows quickly but ordinarily does not exceed medium size. The rich dark-green leaves are divided into oblong leaflets, and contrasted against them much of the year are few or many magnificent, vivid-scarlet, erect flowers. Because of the fact that unexpanded flowers contain water the tulip tree is also called the “fountain tree.” Canoe-shaped or sword-shaped capsules up to a foot long ripen in formidable-looking sheaves radiating upwards from branch ends.—Kamanele Park; University Street; School Street, by bridge crossing Nuuanu Stream; Makiki Valley, nursery of Board of Agriculture and Forestry.

Leaves.—Dark-green, pinnate; leaflets mostly in 9s—4 pairs and an odd 1 at the tip—oblong, pointed, distinctly veined. *Flowers*.—Rich orange-red with yellow margins, large, erect, terminal, clustered, irregular cup-shaped. *Fruit*.—Canoe-shaped, 2-valved capsule up to a foot long, in clusters, radiating upwards; seeds white, small, light, surrounded by a membranous wing. *Home*.—Tropical Africa.

Calabash tree (*Crescentia cujete* Linnaeus).—As strange looking as the sausage tree, its smaller relative, the calabash tree, can be found in a few places in Honolulu. In the West Indies and in tropical America it is a familiar sight. Its large, stiff, smooth branches spread horizontally and are clothed with long, glossy leaves. Singly or in pairs, large pale-green or yellowish flowers hang downwards, when decaying emitting a disagreeable odor. The fruit is round, conspicuous for its size, being up to ten inches in diameter, green or purple in color, and hangs by short stems from the branches. The woody shells, which polish easily and by tying can be trained to different forms, are carved and used in some countries for receptacles and for ornaments. The juice and pulp are valued medicinally, for coughs.—Capitol grounds; Nuuanu Avenue near Wyllie Street.

A Mexican myth tells of a forbidden gourd tree. Pandora-like, a princess tasted the fruit, and she became the mother of twins, who were both impish and godlike.

Leaves.—At intervals in bundles or alone and alternate, oval, shortly pointed or rounded at the tip, narrow at the base, hardly any stem, upper surface glossy, 4-6 inches long. *Flowers*.—Single or paired, large, tubular, pendulous, curved, pale-green or yellowish, with red or purple lines. *Calyx*.—Two-parted or deeply 5-cleft. *Corolla*.—Constricted below the middle, swelled

above; 5 equal, pointed, toothed lobes. *Stamens*.—Four or five. *Fruit*.—Round, green or purple, smooth, 6-10 inches in diameter, short stemmed; shell hard and woody, pulp and seeds inside. *Home*.—Tropical America.

Sausage tree (*Kigelia africana* Benthams).—In a few places in Honolulu, specimens of the sausage tree can be found, sometimes with their odd-looking fruit dangling in the air. The tree is symmetrical and of medium size, and its wide-spreading branches bear large compound leaves, which fall at the end of the season. Purplish flowers—large, showy, and bell shaped—hang in long clusters and drop after a day's flowering. The gourdlike fruit resembles a huge sausage in shape and is rough surfaced and gray. Its stem increases in length as the fruit increases in age. It rarely sets in Hawaii. In East Africa the wood is used in making fire by friction.—Fernhurst; Moanalua Gardens; Queen's Hospital; grounds of University of Hawaii.

Leaves.—Large, pinnate; 7-9 leaflets, the odd one at the tip, oval, with pointed or rounded tip. *Flowers*.—About 4 inches in diameter, bell-shaped, ranging from dark purple-red to magenta, in long, open, hanging panicles. *Fruit*.—Sausage-shaped, 12-20 by 3-4 inches, rough, gray, on cordlike stems, hanging for several weeks. *Home*.—West coast of tropical Africa.

ACANTHUS FAMILY

(Acanthaceae)

Thunbergia, purple allamanda (*Thunbergia grandiflora* Roxburgh). Figure 65, *a*.—That sturdy vine with narrow, bell-shaped flowers, which spread five soft, pale-blue lobes from a white throat, is one of the thunbergias. The leaves are broad and oval, indented at the base, toothed or lobed, and somewhat rough on both sides. To trellises and arbors this many-flowered vine is a highly decorative addition.—Manoa Road, nearly opposite Lanihuli Drive.

Leaves.—Broadly ovate, toothed or lobed, base indented, overlapping one another, somewhat rough on both sides. *Flowers*.—Pale-blue with white throat, large, axillary, solitary or in axillary racemes, many. *Corolla*.—Pale-blue, bell-shaped, three inches in diameter, five large spreading rounded lobes. *Stamens*.—Four. *Fruit*.—Capsule with four round seeds; does not form in Hawaii. *Home*.—India.

Thunbergia (*Thunbergia erecta* T. Anderson).—Most thunbergias are vines. But in a few places in Honolulu is a kind that grows as a shrub. It is between two and five feet high and is characterized

by open, spreading branches and square stems. The leaves are arranged in pairs and are small, oval, dark-green. The funnel shape of the attractive flowers is modified by being curved and somewhat flattened; the five spreading lobes are purplish-blue, and the interior of the tube is deep-yellow.—Grounds of Territorial Office Building.

Leaves.—Opposite, ovate or nearly rhomboid, smooth, entire or sinuate-toothed, small, dark-green. *Flowers*.—Large, axillary, solitary; bud completely enclosed by bractlets. *Calyx*.—Twelve to 14 short teeth covered with two large bracts. *Corolla*.—Funnel-shaped, tube curved, laterally compressed, deep-yellow within; limb purple, $1\frac{1}{2}$ -2 inches in diameter, five heart-shaped or rounded lobes, nearly equal. *Stamens*.—Four, two longer, two shorter. *Pistil*.—Stigma dilated, two-lobed. *Fruit*.—Capsules in pairs, ending in a long, sword-shaped, obtuse, empty beak, containing four round seeds. *Home*.—Tropical west Africa.

Thunbergia (*Thunbergia alata* Bojer).—With a square, hairy stem one thunbergia climbs on trellises and walls, which it makes particularly attractive in flowering season. Then the tubular flowers, purple-throated, with spreading, scalloped margins, buff in color, dot the background of spear-shaped, wing-stemmed leaves.—Waioli Tea Room.

Leaves.—Opposite, triangular ovate, hastate, repand-toothed, rough-pubescent, woolly beneath; stems as long as leaves, winged. *Flowers*.—Solitary, axillary. *Calyx*.—Very small, surrounded by two large inflated bracts. *Corolla*.—Tube somewhat longer than involucre, dark-purple within; limb rotate, oblique, of five rounded segments, buff or cream. *Home*.—Southeast Africa.

Sanchezia (*Sanchezia nobilis* Hooker).—The sturdy shrub, sanchezia, grows five or six feet high. Its conspicuous flowers—yellow, with bright-red bracts at the base—grow in heads from the ends of the branches, which are four-angled. The large, oval leaves are slightly toothed and pointed, and they have winged stems.—Reported to be in a few gardens.

Leaves.—Opposite, slightly toothed, 3-9 inches long, ovate to long and pointed, stems winged, white banded. *Flowers*.—Yellow, two inches long, in heads at the ends of branches, subtended by bright-red bracts. *Calyx*.—Deeply five-parted in oblong segments. *Corolla*.—Tube long, cylindrical, somewhat ventricose above the middle, five equal short round lobes. *Stamens*.—Two perfect below the middle of the tube, two between not functioning. *Home*.—Ecuador.

Barleria (*Barleria cristata* Linnaeus). Figure 65, *b*.—The low, much branched shrub, barleria, has flowers resembling, in a general

way, those of jacaranda, being similar in size and violet in color, and having a long-tubed funnel shape ending in five rounded lobes. In Honolulu it is fairly common and serves a useful and ornamental purpose as a hedge plant. Or it is purely ornamental, as a garden shrub.—Grounds of Territorial Office Building and of University of Hawaii.



FIGURE 65.—Acanthus family: *a*, thunbergia (*Thunbergia grandiflora*), leaves and flowers; *b*, barleria (*Barleria cristata*), leaves and flowers.

Leaves.—Opposite, ovate, acute. *Flowers*.—Large, violet or white, axillary. *Calyx*.—Four sepals, in pairs, outer larger; two large green bractlets with toothed margins. *Corolla*.—Long tube, funnel shaped above, lobes five, overlapping, nearly equal. *Stamens*.—Two perfect, two to three rudimentary, minute. *Pistil*.—Long, slightly bifid. *Fruit*.—Oblong capsules; seeds four or two, flat, with silky adpressed hair. *Home*.—India.

Caricature plant, morado [*Graptophyllum pictum* (Linnaeus) Griffith].—A large ornamental shrub rather common on lawns in Honolulu bears the popular name of “caricature plant” because on

many plants the leaves, which are oval and rather large, are mottled with various shapes in white or yellow or purple on a background of green. Some plants have plain green or purplish leaves. The scientific name, *Graaptophyllum*, means "writing" and "leaves." Though less conspicuous than the foliage, the flowers are attractive, being purple and borne in short clusters at the ends of branches.—In large hedges.

Leaves.—Opposite, ovate, pointed at both ends, 4-8 inches by 2-4 inches, green mottled with white or yellow-white or dull-purple, stems short; no two leaves marked alike but all with light color nearest the midrib. *Flowers*.—Purple, in terminal panicles, 1½ inches long; two-lipped, the upper lip shortly two-lobed, the lower three-lobed, wide-gaping. *Stamens*.—Two bearing pollen, two small ones not functioning. *Fruit*.—Oblong, hard capsule on a long stem. *Home*.—New Guinea and neighboring islands.

COFFEE FAMILY

(Rubiaceae)

Rondeletia (*Rondeletia odorata* Jacquin).—The rondeletia is an ornamental shrub four to five feet high, which looks somewhat like the ixora but is smaller. Its leaves are small and oval. Orange-red, yellow-throated flowers grow in clusters of 10 to 30, each with four or five rounded lobes spreading from a slender tube. It is not a common plant in Honolulu.—In a few gardens.

Leaves.—Ovate, opposite, small, veins sunken; nearly sessile. *Flowers*.—Orange-red, yellow throated, clusters 10-30 flowered and 4 inches across or more. *Calyx*.—Lobes 4-5. *Corolla*.—Salver shaped, slender tube, limb with 4-5 elliptical or round lobes, 1 inch across. *Stamens*.—On throat, included. *Fruit*.—Capsule, opening down middle of carpels. *Home*.—Cuba and Mexico.

Gardenia, cape jasmine (*Gardenia florida* Linnaeus). Figure 66, a.—At one time in the United States the gardenia was considered the finest shrub for the conservatory, where it was grown for cut flowers by florists. In southern United States it is used for hedges, being a rather tender shrub two to six feet high. In Hawaii it grows remarkably well. The thick, evergreen leaves are elliptical and pointed at both ends. Double flowers are much more popular than single ones; are large, wax-white, turning buff on fading; and are strongly fragrant (resembling the odor of ginger flowers). The fruit is large, pulpy, and many seeded.—Grounds of Territorial Office Building.

Leaves.—Thick, evergreen, elliptical, acute at both ends. *Flowers*.—Wax-white, turning yellowish, strongly scented, mostly double. *Calyx*.—Some tubular, ribbed, 5-toothed. *Corolla*.—Long, cylindrical tube, lobes 6-9. *Stamens*.—As many as corolla lobes. *Pistil*.—Stigma large, club shaped, lobed. *Fruit*.—Large, outer coat fleshy, bony layer inside, splitting into a few valves; seeds many, flattened, packed in pulp. *Home*.—China and Japan.

Arabian coffee (*Coffea arabica* Linnaeus). Figure 66, b.—In 1823 the first coffee plants were brought to Hawaii and set out in a plantation in Manoa Valley. The Arabian kind has succeeded best in Kona, Hawaii, where many plantations are flourishing, and the product is being sold as "Kona coffee." Between elevations of 1,000 and 2,000 feet or higher, trees are also growing wild in Kona and elsewhere in Hawaii. In the United States coffee grows in Florida; in southern California it is used as an ornamental shrub. The plant is not immune to pests, a fungus and a fly injuring it.

Shining leaves, fragrant white flowers, red berries are striking characters of coffee plants. The tree is at most 15 feet high and where cultivated is pruned low to facilitate berry-picking. The leaves are used for tea in some countries. The attractive flowers grow massed in thick clusters along spreading branches. Later, when the fruit is developing into bright-red fleshy berries, each of which contains two seeds, moist weather is needed. For the wood, dry weather is best. As the crop develops slowly, only one can be raised a year. Before it is ready for the market the coffee bean goes through many processes: it is dried, it is shelled, it is stored to season, it is roasted and ground. Chemical principles in the bean are caffeine, a peculiar tannic acid, and quinic acid.—Pauoa Road near Nuuanu Avenue.

Several legends tell of the discovery of coffee. According to one legend sheep eating the berries became elated and sleepless at night. About 1258 A. D. Sheik Omar was in exile, and when, like Job, he complained of his troubles a colorful bird sang in a tree. Omar reached for the bird, but grasped berries and flowers. From these he made a perfumed drink that alleviated his exile. In another legend the greatest sorrow of a monk was his drowsiness during prayers. One day he saw a goatherd dancing with his goats and was told that the gaiety was produced by the berry of a shrub. The monk felt sure that this was a cure for drowsiness sent to him by Mohamet, and soon the monastery became known as the home of the

"Wakeful Monks," for they used the fragrant drink to encourage them to pray. Some, however, claimed that the wakeful drink was a devil's potion. The pope was curious about the beverage and after tasting it decided it was too good for infidels alone. So he baptized it, and it became Christian. An old Arabian manuscript states, "He



FIGURE 66.—Coffee family: *a*, gardenia (*Gardenia florida*), leaves and flower; *b*, Arabian coffee (*Coffea arabica*), leaves, flowers, fruit; *c*, cup-and-saucer plant (*Holmskioldia sanguinea*), leaf and flowers; *d*, noni (*Morinda citrifolia*), leaves, flowers, fruit; *e*, ixora (*Ixora macrothyrsa*), leaves and flowering head.

that would drink it for liveness sake, and to discusse slothfulness, and the other properties that we have mentioned, let him use much sweat meates with it, and oyle of pistaccioes, and butter. Some drink it with milk, but it is an error, and such as may bring in the danger of leprosy."

Leaves.—Glossy, rather thin, elliptical, 3-6 inches long, point $\frac{1}{2}$ inch long. *Flowers*.—White, very fragrant, in axillary clusters, 3-5 flowers together, 5 corolla segments 4 times as long as wide. *Fruit*.—Bright-red, oval, fleshy berry, containing 2 seeds, each half-oval, $\frac{1}{2}$ inch long. *Home*.—Arabia and tropical Africa.

Liberian coffee (*Coffea liberica* Hiern).—The Liberian kind of coffee tree is larger, more vigorous, more tropical (growing at lower elevations) than the Arabian. Both kinds are grown throughout the Tropics. The Liberian tree grows wild in mountains back of Honolulu. Its leaves are longer and have a shorter point. The flowers are more robust and abundant. The fruit is more prolific and different in appearance from the Arabian kind, being round, dull-red, pulpier around the seeds. Though the flavor is very good, the bean from this tree is not popular in Hawaii.—Beside upper part of Tanalus Road.

Leaves.—Like *C. arabica* but longer, 6-12 inches long, point blunter and shorter. *Flowers*.—Like *C. arabica*, but more robust and productive, 15 or more in a cluster, corolla segments 6-8. *Fruit*.—Like *C. arabica* but more prolific, nearly round, pulp larger in proportion to seeds, needs a year to ripen. *Home*.—Tropical Africa.

Ixora (*Ixora macrothyrsa* Teijsmann and Binnendijk). Figure 66, *e*.—The ixora is a large, smooth shrub, which is fond of heat and moisture. It is common on lawns in Honolulu. The leaves are handsome, large, and shining. From the ends of branches and from leaf axils the small, deep-red flowers grow crowded in a round head, and they can be found somewhere in town most of the year. The individual flowers are popular among the Hawaiians for stringing together in leis. The plants are grown more easily from cuttings than from seeds.—Corner of Heulu and Keeaumoku streets.

Several other species of ixora are less common in Honolulu, one white, fragrant kind being especially attractive.

Leaves.—Smooth, shining, oblong, narrow, entire, pointed, nearly 12 inches long, opposite or whorled, slightly folded longitudinally, short stemmed. *Flowers*.—In large, round clusters, some 8 inches in diameter, crowded with small deep-red individuals, terminal or axillary. *Calyx*.—Undeveloped. *Corolla*.—A long, narrow tube split into 4 oval spreading lobes. *Stamens*.—Inserted on throat of corolla, 4 or 5, filaments short or absent, anthers small, linear. *Pistil*.—Style 2-branched. *Fruit*.—Round or somewhat paired, with 2 plano-convex kernels. *Home*.—East Indies (Bailey); Malaysia (Rock).

Stink vine, maile pilau (*Pacderia foetida*). See page 312.

Noni, Indian mulberry (*Morinda citrifolia* Linnaeus). Figure 66, d.—The *noni* is a small evergreen tree or shrub with angular branches and thick branchlets marked with leaf scars. The most striking features of the tree are the leaves—large, shining, oval—and the fruit—whitish-yellow, oval, marked off in hexagonal figures—which is borne prolifically and in many different stages at a time. As it has long been known in many warm parts of the world and also as it grows in open lowlands, it is believed that the *noni* was brought to Hawaii by the early Polynesians. It was useful to them, for the smooth bark yields a red, the root a yellow dye, and in times of scarcity the insipid or rather unpleasant-tasting fruit was eaten. *Morinda* is Latin for “Indian mulberry.”—In lower forests; Sacred Falls Valley (Kaliuwaa); Makiki Valley, nursery of Board of Agriculture and Forestry.

Several Polynesian stories tell of heroes and heroines who were driven to live on the *noni* in days of famine. When Kamapuaa, the pig god who loved Pele, was taunting her, he chanted:

“I have seen the woman gathering *noni*,
Scratching *noni*,
Pounding *noni*.”

In some way the words conveyed the meaning that Pele, the volcano goddess, had red eyes, and this so angered her that she plunged into battle with him.

Because they made a bright-yellow dye from this plant, the Tahitians say that the *noni* was produced from ear wax. In Tongan myth Maui was restored to life by having the leaves of the *noni* placed upon his body.

Leaves.—Shining, ovate, 6-8 by 4-6 inches, opposite or rarely in 3s, thick, many, distinctly veined, prominent beneath, short stemmed, closely placed. *Flowers*.—About 1 inch long, united in a small round head, which increases in size and becomes the fruit, 1 head on a stem, ordinarily in axil of every other pair of leaves. *Calyx*.—Short, ending abruptly. *Corolla*.—White, stiff, tubu-

lar or bell shaped, $\frac{1}{4}$ - $\frac{1}{2}$ inch long, 5-7 cleft, hairy below the middle. *Fruit*.—Whitish-yellow, oval, several inches long, fleshy, nearly smooth, but marked off in hexagonal figures with a pit in the center of each, representing several fruits united, insipid or unpleasant tasting and smelling, many; seeds oval or kidney shaped. *Home*.—Asia, Australia, Pacific islands.

Cup-and-saucer plant, parasol flower (*Holmskioldia sanguinea* Retz). Figure 66, *c*.—From six to eight feet high the shrubby cup-and-saucer plant ordinarily grows. It is a dainty plant with odd and beautiful little flowers, the colors of which grade from orange to red and the form resembles a saucer supporting a narrow funnel-shaped cup.—Corner of University and Metcalf streets.

Leaves.—Opposite, ovate, pointed, 1-3 inches long. *Flowers*.—Cymes axillary or crowded terminal, short stemmed, orange to red. *Calyx*.—Spreading, shallow cup shaped, thin, colored, veined, margin entire. *Corolla*.—An arched and colored tube widening above, edge spreading, 5-fissured, the lateral divisions smaller than those in front. *Stamens*.—Four, inserted in lower part of corolla and extending outside, anthers oval. *Fruit*.—Rounded, 4 divisions, each with a seed. *Home*.—Subtropical Himalayas and mountains of Burma, 0-4,000 feet elevation.

HONEYSUCKLE FAMILY

(Caprifoliaceae)

Honeysuckle (*Lonicera japonica* Thunberg). Figure 67, *b*.—Stone walls and porch lattice-work are two common and most suitable locations for honeysuckles, vines that are common in some countries, even growing wild in eastern United States between New York and North Carolina. The leaves, thick, oval, and pointed, come from the stem in pairs. At first white, the short-lived flowers soon turn yellow, all the time diffusing fragrance. They appear in pairs along the stems or several together at the ends of branches. The narrow tube is split into two lips, which have five lobes and beyond which arch five long stamens.—2347 Vancouver Highway; Vancouver Highway near Oahu Avenue.

A rarer kind of honeysuckle (*Lonicera heckrottii*) does not climb much, and it bears yellow and pink flowers in spikes.

Leaves.—Opposite, entire, roundish ovate to oblong, downy beneath or almost smooth, $1\frac{1}{2}$ -3 inches long. *Flowers*.—White changing to yellow, very fragrant, $1\frac{1}{2}$ -2 inches long, in axillary short-stemmed pairs or in unstemmed whorls at the ends of branches. *Calyx*.—Five-toothed. *Corolla*.—Short, slender tube, 2-lipped, 5-lobed. *Stamens*.—Five. *Fruit*.—Black berries, several-seeded. *Home*.—Himalaya region.

GOODENIA FAMILY

(Goodeniaceae)

Scaevola, naupaka (*Scaevola chamissoniana* Gaudichaud). Figure 67, *a*.—A scaevola found only in Hawaii is a common mountain shrub four to six feet high. On the smooth branches are small, oval or narrow leaves. As in the seaside scaevola, the flowers, which are smaller, look like half flowers. They appear white at a little distance, but when examined closely are found to be streaked with purple. More than half a dozen grow in a cluster about as long as the leaf and produce small berry-like fruit.—Beside upper Tantalus road.



FIGURE 67.—Goodenia family: *a*, *naupaka* (*Scaevola chamissoniana*), leaf, flowers, fruit. Honeysuckle family: *b*, honeysuckle (*Lonicera japonica*), leaves and flowers.

Leaves.—Alternate, obovate or narrow and pointed at both ends, 2-4 by $\frac{3}{4}$ -1 $\frac{1}{2}$ inches, papery, smooth, toothed in upper half; stems $\frac{1}{2}$ - $\frac{1}{4}$ inch long. **Flowers.**—In an axillary cyme about as long as the leaf, composed of 7-15 flowers, some turned to one side, stem $\frac{1}{2}$ -2 $\frac{1}{2}$ inches long. **Calyx.**—Oval, $\frac{1}{6}$ inch long, 5-toothed, smooth, the teeth of some hairy. **Corolla.**—White with purple streaks, downy inside, the tube $\frac{2}{3}$ inch long, broadly winged, margins truncate, lip short and protruding, slit to base on upper side, margins folded inwards and nearly equal. **Stamens.**—Almost as long as tube, 5. **Pistil.**—Style incurved, downy below. **Fruit.**—Drupe, elliptical, fleshy, enclosing a seed, nearly $\frac{1}{2}$ inch long, smooth, pale-blue or white, ripening to black. **Home.**—Hawaii.

Scaevola, naupaka [*Scaevola koenigii* Vahl or *S. frutescens* (Miller) Krause].—Close to the sea on Pacific islands and countries bordering the Pacific on the west may be found a scaevola with sweet-perfumed flowers. In some parts of Hawaii it is common on beaches, where it spreads thick, soft branches on the sand, only in sheltered places growing higher than three feet. In Ceylon a similar plant grows to a height of ten feet. Even in driest times it remains green. The plant branches much from the base and bears fleshy, bright-green leaves, which are rounded and notched at the tip. The flowers are clustered, white streaked with purple, and larger than those of the mountain scaevola. They appear to be split in two, with only half the flower remaining, and they produce white, succulent berries. In Ceylon and some other tropical countries of the East, sun hats and floats are made from the pith of the plant.—Mostly outside of Honolulu, as along road near beaches on windward Oahu.

According to an old Hawaiian chant, the ocean *naupaka* was born of heaven and earth.

The *naupaka* flower legend is one of the best known of Hawaii. It has several variants. Two lovers quarreled and the maiden tore a *naupaka* flower in two and declared she would never love her old sweetheart again until he should bring to her a perfect flower. He searched all over the islands, but in vain, for these flowers, whether they grew on the seashore, on the plains, or in the mountains, had become but half flowers. And it is said that he died of a broken heart.

Another legend tells of a beautiful stranger who fell in love with a village youth. When he turned from her and went back to his sweetheart, the beautiful woman followed him and tore him from her embrace. Anger blazed about the woman, and they knew that she was Pele, goddess of volcanoes. She pursued the youth into the mountains, hurling her lava after him. Then the gods took pity on him and transformed him into a half flower, the *naupaka*. Pele shrieked with rage and fled on a river of lava to the ocean. She overtook the maid, whom the gods turned into a beach *naupaka*. The lovers are forever separated, for the half flowers of the youth still bloom alone in the mountains, and the half flowers of the maiden blossom alone on the beach.

Leaves.—Fleshy, downy to nearly smooth, convex, bright-green, obovate, 3-5 by 1½-2 inches, rounded, notched at tip, narrowing into a short stem, veins

hidden. *Flowers*.—Fragrant, in a downy cyme 1-3 inches long and 5-9 flowered and on stem $1/3$ - $3/4$ inch long. *Calyx*.—Woolly, $1/4$ inch long, lobes lanceolate and nearly as long as tube. *Corolla*.—White with purple streaks, woolly, about $1/2$ inch long, the 5 lobes shorter than tube, spreading, obovate, pointed, the broad wings joining at tip. *Stamens*.—Five. *Pistil*.—Style bristly, strongly curved, protruding through split corolla tube. *Fruit*.—Round, white, succulent berries, inconspicuous but pretty, $1/2$ inch long, downy, 5 or 10-ribbed, 2-celled, containing a rough bony stone. *Home*.—Polynesia, tropical Asia, and adjoining islands (Hillebrand); tropical regions (Kew Index).

ASTER FAMILY

(Compositae)

Ironweed (*Vernonia cinerea*). See page 312.

Horseweed, Canada fleabane, iliohe (*Erigeron canadensis* Linnaeus). Figure 68, *a*.—The horseweed is a familiar sight in waste land in Hawaii as well as in many other parts of the world. It ranges in height from a few inches to two yards, a single smooth or hairy stem rising vertically and bearing many narrow leaves. Because of its bitter juice horseweed is avoided by animals; but it is used by man, as it yields the oil of fleabane, a volatile oil that keeps mosquitoes away. In the drug market dried plants sell for five to six cents a pound. Flowers grow in small heads, several together, and produce seeds that float in the wind by means of a tuft of bristly hairs.—In fields and empty lots.

Leaves.—Densely clothing stem, erect, linear-lanceolate, 2-4 inches long, slightly aromatic; lower leaves toothed, tapering to a short stem, dying and hanging down. *Flowers*.—Spreading, leafy panicle with many small cylindrical flower heads $1/6$ inch long and short stalked; involucral bracts linear-lanceolate, smooth, margins rough, in 2 rows; ray flowers many, scarcely exceeding pappus, narrow filiform, white; disk flowers 4-7, tubular, 4-5 toothed. *Fruit*.—Seeds tiny, flat, each with tuft of bristly pappus, which is twice as long as seeds, expanded, whitish. *Home*.—Probably North America.

Pluchea (*Pluchea indica* Lesson).—The pluchea is a smooth, woody, much branched shrub that grows from a few to several feet high. It was brought to Hawaii rather recently and is now thriving as a weed in low places, especially bordering salt marshes. It associates with *Batis maritima*. The plant is rounded in form and at the ends of branches has large, rounded flowering clusters composed of many small flower heads, which resemble tiny lavender asters. The leaves are an inch or two long and bear several points around the edges.—Near canal at Waikiki; along marsh at Ala Moana.

Leaves.—Obovate or oblanceolate, subserrate, 1-2 inches long, blunt or acute or pointed at the tip, alternate, narrowing into short petiole. *Flowers*.—Heads in leafless, downy, branching, terminal clusters; heads $\frac{1}{4}$ inch in diameter, lavender, outer involucre bracts broad with rounded tips; flowers of disk bisexual, 3; flowers of ray female, numerous; receptacle flat, naked. *Stamens*.—Anther bases arrow shaped. *Pistil*.—Style arms of bisexual flower threadlike, entire, or forked. *Fruit*.—Seeds tiny, ribbed; pappus scanty, white, spreading. *Home*.—Asia and tropical Australia.

Cocklebur, kikania (*Xanthium strumarium* Linnaeus var. *echinatum* Murray). Figure 68, *b*.—After the first rains of the season the cocklebur, a common roadside weed in the outskirts of Honolulu, in other parts of Hawaii, and in other parts of the world, rises from the ground for a short existence, usually dying off in the summer. It is a coarse plant growing one to three feet high, has large, oval, toothed leaves, and bears heads of flowers, some of which develop into large oblong burs, for which the plant is best known. These stick to clothing readily and are a particularly bad pest where growing in pastures with horses and cattle. In Hawaii are several kinds of cockleburs, and they look much alike. One kind, at least, when in the stage of young seedlings is said to be poisonous to horses and cattle.—On waste land in Koko Head region.

Leaves.—Triangular, ovate, somewhat heart shaped, or 3-lobed, obtuse, alternate, 3-veined, coarsely toothed; stems 5-6 inches long. *Flowers*.—Heads in axillary clusters, upper male, lower female; male heads round, many-flowered, involucre bracts few, short, narrow, corolla tubular, 5-toothed filaments united, anthers free, style rudimentary and entire; female heads 2-flowered, involucre united and closed, ovoid, covered with hooks, 2-beaked, no corolla, style branches extending from beaks. *Fruit*.—Burlike, oblong, nearly 1 inch long, bearing hooks and incurved beaks, both hooks and beaks viscous-hairy at bases; achenes inside. *Home*.—Cosmopolitan.

Tree marigold, wild sunflower [*Tithonia diversifolia* (Hemsley) A. Gray]. Figure 68, *d*.—On roadsides and in gardens, clumps of the shrubby tree marigold are growing here and there in Honolulu. In Ceylon and India it has also become a weed, in Ceylon, where it grows up to an elevation of 5,000 feet, being the commonest weed next to lantana. It is conspicuous and ornamental, being a branching shrub from about 5 to 25 feet tall, bearing many orange-yellow, daisy-like flower heads, each three inches or so in diameter. Many of the leaves, which are fuzzy, have three lobes; but the number varies somewhat.—Roadside near highest part of Tantalus road.

Leaves.—Alternate, 3-8 by $1\frac{1}{2}$ -7 inches, ovate or somewhat triangular, 3-5 lobed or not lobed, rather pointed, base somewhat rounded and narrowing into the stem, edges toothed, 3-veined, pale-green and hairy beneath, hairy for a while above; stems with narrow margins nearly to base, 2-lobed at base. *Flowers*.—Heads $2\frac{1}{2}$ - $5\frac{1}{2}$ inches wide, on hollow stems 10 inches long or less; disk up to nearly 1 inch high and to $1\frac{1}{2}$ inches wide, disk flowers hairy below; involucre in 4 series; rays 12-14, golden-yellow, elliptic, 3-toothed, 2 inches long or less. *Fruit*.—Achenes hairy, up to $\frac{1}{5}$ inch long, 2-awned. *Home*.—Mexico.

Bidens, bur marigold, stick-tights, beggar ticks, Spanish needles, nehe (*Bidens pilosa* Linnaeus). Figure 68, *c*.—All over Hawaii from low land to an elevation of about 4,000 feet, especially on damp ground, one of the commonest weeds is the bidens, of which several species are known here. As similar species are well known in many other warm countries, the popular names are the same. Their forked, narrow, dark seeds readily fasten themselves to clothing and to the hair or wool of cattle or sheep. The species usually seen in Hawaii is a rather hairy plant a foot high or more and has oval or three-parted hairy leaves with toothed margins. The flowers form small heads made up of about a dozen little yellow flowers.—By roads and in fields.

Leaves.—Thin; either all simple or 3-parted or 3-lobed; simple leaves ovate, 1-2 inches long, pointed, sharp toothed, opposite, bearing white hairs; stems $\frac{1}{2}$ -1 inch long. *Flowers*.—Heads few, discoid, in leafy cluster, about $\frac{1}{4}$ inch high; blooming all the year; no ray flowers or a few whitish ligules; disk florets 12-20, tubular, yellow, nectariferous; pedicels $\frac{1}{2}$ - $1\frac{1}{4}$ inches long. *Fruit*.—Achenes straight or curved, 4-angled, up to $\frac{1}{2}$ inch long, hairy or smooth, about 20, 2-4 awned, the awns about a quarter the length of the achenes and barbed. *Home*.—West Indies and South America.

Flora's paint brush, tassel flower (*Emilia sonchifolia* DeCandolle). Figure 68, *e*.—At first cultivated as a garden plant, the tassel flower has become a weed in Hawaii, being self-sown in fields and lawns and by roads. Small flower heads form in clusters at the end of long, erect, slender, smooth or hairy stems, which are prostrate at the base. The flowers range in color from crimson to scarlet to yellow. Here and there the stems are clasped by long pointed leaves, with shallow-toothed margins. The plants grow from one foot to two feet high. In Hawaii they are found between sea level and an elevation of about 1,000 feet; on the United States mainland they are cultivated in gardens.—On lawns and in fields.

Leaves.—Lanceolate-oblong or ovate-lanceolate, clasping the stem, remotely scalloped or toothed, alternate, hairy, $1\frac{1}{2}$ inches long or more, lower leaves

FIGURE 68.—Aster family: *a*, horseweed (*Erigeron canadensis*), young plant, leaves, flowering head, individual flower head and empty heads, fruit; *b*, cocklebur (*Xanthium strumarium*), leaves, flowering heads, burs; *c*, bidens (*Bidens pilosa*), leaves, flower (below), young fruit (above), ripe fruit; *d*, tree marigold (*Tithonia diversifolia*), leaves and flower; *e*, tassel flower (*Emilia sonchifolia*), leaves and flowers.



may have margined petioles. *Flowers*.—In small heads, a few of which terminate the stem of the plant, orange to scarlet; florets numerous, tubular, bisexual, involucre cup shaped, made up of scales shorter than the florets, no rays. *Stamens*.—Anther bases obtuse. *Pistil*.—Style arms tipped with conical tuft of hair. *Fruit*.—Achenes with 5 sharp hairy angles, white, long, narrow, each tufted with a bunch of white pappus. *Home*.—East Indies, Philippines.

Burdock, gobo (*Arctium lappa* Linnaeus).—In North America the burdock is despised as a weed; in Japan and to some extent in Hawaii it is cultivated for the sake of its edible root, which by breeding has been improved and enlarged. For among Japanese this root is a common vegetable. The plant is coarse and smooth, has large soft leaves that are whitish beneath, and in summer produces pink flowers. Its most conspicuous feature is its bur, a seed case bristling with hooks that attach easily to coats of animals and to clothing of people. The scientific name, *Arctium*, means "bear," probably referring to the rough bur.—Vegetable gardens, upper Manoa Valley.

Leaves.—Oval, large, soft, whitish beneath, becoming dark-green above. *Flowers*.—In heads, each surrounded by an involucre, the scales of which become hooked, pinkish. *Fruit*.—A bur, large, round, bearing hooked scales, carried far by animals, receptacle densely bristly, pappus deciduous of bristles; containing many seeds. *Home*.—Europe.

False Saffron, safflower, mamo (*Carthamus tinctorius*). See page 313.

Sow thistle, pualele (*Sonchus oleraceus* Linnaeus).—From lowlands to an elevation of 10,000 feet in Hawaii the sow thistle is a common weed, as it is in many other parts of the world. In Europe and New Zealand and probably elsewhere the plant is cooked and used as a vegetable. It is also fed to stock, especially swine; and rabbits like it. In Hawaii it is used medicinally. The plant grows one to three feet high and has hollow, angular stems and milky juice. Among the leaves, which are thin and toothed, appear in short clusters heads of flowers, each composed of several small, pale-yellow individuals, which are a source of honey to insects. Each seed is flat, is ridged transversely, and bears a tuft of white hairs, by which the wind wafts it through the air and which is the cause of the name *pualele*, Hawaiian for "flying flowers."—On lawns and in fields.

Leaves.—Thin, bordered with irregular pointed or prickly teeth, not divided or pinnatifid, with broad heart-shaped or triangular terminal lobe; upper leaves narrow, lanceolate, and clasping stem with short, pointed auricles; lower leaves stemmed. *Flowers*.—Heads in short cluster, each head nearly 1 inch across, florets pale-yellow, involucre with imbricate bracts that ordinarily become conical after flowering. *Fruit*.—Achenes many, transversely rugose, flat, not beaked, with white pappus of soft, fine hairs. *Home*.—Probably Europe, Asia (Hillebrand); cosmopolitan (Kew Index).

ADDITIONAL SPECIES

The following descriptions of species are additional to those recorded in the first edition of "In Honolulu Gardens."

GRASS FAMILY

(Gramineae)

Piipii, pilipiliula [*Rhaphis aciculata* (Retzius) Desvaux].—A common perennial grass thriving in dry fields and on rocky slopes is the *piipii* of the Hawaiians. As it is found in many Pacific islands and also in Australia, India, and China, it was probably introduced to Hawaii by man. It furnishes feed for cattle. The grass creeps, rooting at the base, from which it rises erect about a foot high. Some stems branch. In the lower part, the stems have five or six nodes, and long, narrow leaves are crowded there. In the upper part are a few short leaves. The leaf sheaths ordinarily overlap. Flowering stems rise from branch ends and bear open, elliptical clusters an inch or two long, which are made up of trios of purplish spikelets. When the spikelets have ripened to fruit they possess a barb that catches on clothing and on wool of sheep.

Leaves.—Crowded below, 3-6 by 1/6-1/4 inch; blades flat, smooth, rough on margin with sharp rather distant teeth; upper leaves short, sheaths long, smooth, hairy-margined, mostly overlapping; base of some shoots covered with overlapping scalelike sheaths. *Flowers*.—Panicles open, elliptical, 1-3 inches long, with slender, ascending, smooth branches; spikelets narrow, pointed, smooth, purplish, 3 together, central one sessile and perfect, two lateral ones stemmed and sterile and 1/4 inch long; callus on perfect spikelet with a barbed hair. *Fruit*.—Oblong grain. *Home*.—Tropical regions.

Chloris (*Chloris paraguayensis* Steudel). Figure 69 a.—Along the streets and on lawns a chloris has gained a foothold, an annual grass growing in tufts. It is widespread in tropical regions and was introduced to Hawaii from some other tropical country. Specimens were first described from Paraguay. Smooth stems rise a foot or two high and are clothed with sheaths, which do not completely cover the internodes. The leaves have narrow, flat blades about four inches long. The striking part of the plant is the purplish flowering head, which consists of few to several feathery spikes an inch or two long, radiating upwards from the end of a long stem. Close

examination shows that the spikes consist of two rows of flowering parts, which bear silky hairs and are attached to one side of the stem.

YAM FAMILY

(Dioscoreaceae)

Yam, hoi (*Dioscorea bulbifera* Linnaeus).—In ancient times in Hawaii the yam was an important food and was probably brought by early Polynesian immigrants with the sweet potato and taro. Later it was cultivated for ship supplies, especially on Kauai and



FIGURE 69.—Grass family: *a*, chloris (*Chloris paraguayensis*). Spurge family: *b*, shoe flower (*Pedilanthus tithymaloides*?), tip of plant showing leaves and flowers.

Niihau. Today it is common in forests at low elevations, and the tubers can sometimes be bought in the market.

The yam is a vine with smooth, slightly angular stems bearing somewhat heart-shaped leaves, which have a conspicuous network of veins. At the leaf axils long clusters of tiny flowers form and also round, green bulbs (*alaala*), which are occasionally eaten but are very bitter due to the presence of considerable tannin. The subterranean tubers are much more palatable. They resemble potatoes but are coarser and are cooked like them, being boiled or baked or their meal used for cakes and puddings. Sweet potatoes are sometimes wrongly called yams. From Hawaii westward to Africa several different kinds of yams are grown, and a large one is imported to Honolulu from China. Its tubers are about two feet long, and they grow three feet deep. Another kind produces huge tubers, individuals being known to weigh as much as 100 pounds. Like some other kinds these are cooked a long time to remove the bitter taste.

Leaves.—Scattering or nearly opposite, ovate-cordate, tipped with a short point, thin, 5-7 by 4-6 inches, 7-11 prominent veins and a network of smaller ones; stem twisted and thick at base, 2-3 1/2 inches long. *Flowers*.—Minute, about 1/6 inch long, 6-parted, having 2 bracts, axillary, different sexes on separate vines; male: spikes slender, 2-4 inches long, not stemmed; female: spikes about 1 foot long, 3-5 together. *Stamens*.—Staminodes 6, anthers 6. *Pistil*.—Styles 3, recurved, notched at the tip; ovary 3-celled. *Fruit*.—Thin, oblong capsule, 3-lobed, 3-valved; seeds flat, winged at lower end. *Home*.—Pacific islands.

BEECH FAMILY

(Fagaceae)

Chestnut [*Castanea dentata* (Marshall) Borkhausen].—The chestnut is a tall, hardy tree of temperate parts of North America, where it has forested large areas in the past. In recent years a blight has attacked the trees, has killed many, and threatens their extinction. Chestnut timber is preferred for many purposes, as for railroad ties and posts. The shiny, brown nuts, enclosed in large, prickly burs, contain sweet, white kernels, which are very palatable. One tree is growing beside the upper part of the Tantalus road and is known to many people. Its clusters of heavy-scented, cream-colored flowers form in catkins and later some burs.

The tree is easily distinguished by its handsome foliage—smooth, oblong, pointed leaves, six to ten inches long, with conspicuous, straight veins and margins bearing many coarse, pointed teeth. The leaves fall every year.

BEAN FAMILY

(Leguminosae)

Cassia (*Cassia bicapsularis* Linnaeus).—A shrubby cassia is an attractive woody plant that scrambles among rocks and along fences beside the roads and in fields near Honolulu, and it is known in many other tropical countries. It grows four to nine feet high. Round bunches of bright-yellow flowers appear on it much of the year, at the same time as smooth, cylindrical pods, which are nearly six inches long. The plant is said to be used in America, the leaves for a purgative, the wood (in Brazil) for paper making.—Road-sides, Kalihi Valley.

Leaves.—Distinctly stemmed; leaflets 6-8, smooth, thin, obovate, obtuse, 1/2 inch long or more. *Flowers*.—Racemes full of flowers and as long as leaves; bright-yellow, showy, medium sized. *Calyx*.—Sepals 5. *Corolla*.—Petals 5. *Stamens*.—Very unequal, 7 perfect, 3 without anthers. *Fruit*.—Pod cylindrical and tapering slightly, smooth, curved, 5 1/2 inches long, 1/2 inch thick, sutures narrow; seeds transverse, in two series. *Home*.—Tropical America.

Cassia (*Cassia moschata* Humboldt, Bonpland, and Kunth).—A rare cassia but quite conspicuous when in flower is growing at 1328 Matlock Avenue and also in the Hillebrand gardens. Early in the spring in Honolulu, clusters of small, reddish-brown buds open out to orange flowers. No seed pods form. The leaves are shorter, and the leaflets (about 6 1/4 by 1/4 inches) are smaller and much narrower than those of the pink-and-white shower. The tree is spreading and of medium size and grows best on low land. It is worthy of cultivation because of its attractive flowers, which appear in February or March, before many flowering trees have begun to bloom. South America is the home of this cassia.

Kakalaioa (*Caesalpinia crista* Linnaeus).—A large, prickly shrub that climbs or straggles with spreading branches in dry low-lands of Hawaii and many tropical countries bordering the Pacific

is known in Hawaii as *kakalaioa*, which means "prickly." On beaches of both coasts of Mexico it forms dense thickets. Many prickles are borne on the leaf stems, and at the base of the stems small yellow flowers grow in crowded bunches. On long stems curious pods develop, having a thick, spiny covering and containing two or three gray seeds, the best-known part of the plant. Though they are hard—a hammer is needed to crack them—the seeds are light and have been carried long distances by ocean currents, as across the Atlantic. They have many uses; children play with them as marbles, Hawaiians string them in leis, natives of tropical America wear them as talismans. In India they are known as "fever nut" and "physic nut," a powder from the seeds being a medicine resembling quinine and containing the tonic bonducine. They also contain 23 per cent oil, which is employed in some countries to cure convulsions, palsy, snake bites.

Leaves.—Large, bipinnate; pinnae 4-8, 4-6 inches long; leaflets opposite, 6-10 pairs, 1/2-2 inches long, oblong to round, tipped with a point, downy when young, smooth when old; stem 1-1 1/2 feet long, thorny, rhachis also thorny; stipules large and leafy and cut into segments. *Flowers*.—Many in axillary racemes 4-8 inches long, small, yellow; bracts narrow, 1/2 inch long; stem 3/4 inch long. *Calyx*.—Deeply 5-parted, 1/2 inch long, woolly; lobes oblong, 2 lower closer joined than others. *Corolla*.—Petals 5, yellow, slightly longer than sepals. *Stamens*.—Ten, free; filaments rusty woolly. *Pistil*.—Style erect, stigma truncate. *Fruit*.—Pod leathery, ovate-oblong, 2-3 by 1 1/2 inches, bearing soft straight spines, long stemmed; seeds 2-3, gray, shining, hard, rounded, 3/4 inch in diameter. *Home*.—West Indies.

SPURGE FAMILY

(Euphorbiaceae)

Shoe flower (*Pedilanthus tithymaloides?* Poiteau). Figure 69, *b*.—A shrubby plant of great ornamental value is usually seen growing in pots indoors, as at the Academy of Arts. It is characterized by many zigzag stems, some of which bear zigzag branches, small, red, shoe-shaped flowers, and pointed, alternate leaves, which fall soon after forming. The stems are thick, green, and smooth, and they contain a milky juice. Cuttings from them are the source of new plants. About 15 different kinds of shoe flowers are known from tropical America; this one is from South America.

CACTUS FAMILY

(Cactaceae)

Cactus (*Cereus peruvianus*? Miller).—Four conspicuous, tree-like cactus plants growing by the Queen's Hospital are a kind of cereus, a name, meaning "torch," given to this or a related kind of cactus because of the candelabrum-like arrangement of its branches. In its home in some warm part of South America it may grow as high as 50 feet. The branches are straight and long and about 8 inches in diameter. Ordinarily they have 7 or 8 high, compressed ribs, the edges of which are dotted with small, rounded areas bearing spines. The areas are about an inch apart and are bordered with several rigid, short, brown spines, which surround a longer central spine 2 inches long or more. These plants, which were brought to Honolulu by Doctor Hillebrand, have not been known to flower.



FIGURE 70.—Melastoma family: lasiandra (*Tibouchina granulosa*), leaves and flowers.

MELASTOMA FAMILY

(Melastomaceae)

Lasiandra (*Tibouchina granulosa* Cogniaux). Figure 70.—Though not common in Honolulu, the Brazilian plant, lasiandra, is conspicuous, as in a few spots on Tantalus, because of its many dazzling, purple flowers. On Hawaii, along the upper part of the road from Hilo to the Volcano House, it grows in abundance as a high shrub. On square stems, large, oval leaves clothed with white hairs and marked with three to seven distinct veins grow in pairs. Terminating the stems are flower clusters. The calyx, bell shaped and cut into five narrow parts, is not noticeable behind the five brilliant, spreading, velvety petals, from the center of which extend ten curiously bent stamens. Seeds are said to form in a five-parted capsule.

MINT FAMILY

(Labiatae)

Coleus (*Coleus blumei* Benthams, and varieties).—Bordering some garden beds and filling others are a coleus and some of its varieties, soft, shade-loving herbs, two to three feet high. They are popular because of their bright-colored, variegated foliage. The leaves, which are oval and toothed, grow in pairs from a quadrangular stem and display the colors yellow, red, and purple. Small flowers appear in spikes at the tip of the plant.

Leaves.—Opposite, ovate, toothed, narrow or broad at base, pointed, with patterns in yellow, red, and purple. *Flowers*.—At ends of stems in spikelike racemes, small, ordinarily blue. *Calyx*.—Deflexed in fruit, 5-toothed. *Corolla*.—Two-lipped, lower lobes longer than upper. *Home*.—Java.

POTATO FAMILY

(Solanaceae)

Akulikuli, ohelo kai, aeae (*Lycium sandwicense* A. Gray).—Like another *akulikuli* (*Batis maritima*) growing near the sea and salty marshes in and near Honolulu is one with a similar general appearance. It has, however, broader leaves and red berries. The plant grows as a smooth, branching shrub two to three feet high, in places forming dense thickets. Its leaves are thick, juicy, and abundant and are sometimes eaten by stock. Its flowers, which can be

found the year around in company with the berries, are small and white or pinkish.

Leaves.—Most in bundles, fleshy, spatulate, 1 by 1/4 inch near tip, narrowing to small base, midrib indistinct, no veins. *Flowers*.—Small, pale-lilac, on stems up to 1/2 inch long. *Calyx*.—Cut into 4 triangular lobes; about 1/6 inch long. *Corolla*.—Smooth, white or pink, tube equalling calyx; lobes 4, about 1/4 inch, ovate, spreading. *Stamens*.—Inserted on corolla tube, filaments naked, anthers shorter than filaments. *Pistil*.—Style slender, stigma with double plates, ovary 2-celled and containing many ovules. *Fruit*.—Round berry, 1/3 inch or more in diameter, red, edible and refreshing but somewhat salty; seeds flat, kidney shaped. *Home*.—Hawaii.

COFFEE FAMILY

(Rubiaceae)

Stink vine, maile pilau (*Paederia foetida* Linnaeus).—Clusters of small, lavender flowers, in general appearance resembling those of the pride of India, develop into clusters of small, orange berries, which hang from the tall, smooth, high-climbing vine, *maile pilau*. The leaves look like those of the true *maile* but unlike them have a strong unpleasant odor. Though not a native of Hawaii, where it is said to have been introduced accidentally about 1850, this vine grows wild in several parts of Oahu, the seeds having been carried by birds. It is common in parts of southern Asia.—Roadsides, Kalihi Valley.

Leaves.—Ovate or lanceolate, 2-3 by 1-1 1/2 inches, thin; stem about 1 inch long; stipules triangular. *Flowers*.—In compound, axillary clusters 1-2-2 1/2 inches long, some clusters leafy; common stem 1/2-1 inch long. *Calyx*.—A quarter as large as corolla. *Corolla*.—White or pink or lavender, tubular, broad, about 1/4 inch long, with 4 or 5 short lobes, mealy woolly outside, bristly within. *Stamens*.—Anthers attached below middle of tube and covered with hairs. *Pistil*.—Style equals tube, cut to near base into threadlike branches. *Fruit*.—Round or oval berry with thin covering and pulpy seeds. *Home*.—East Indies, Malaysia.

ASTER FAMILY

(Compositae)

Ironweed (*Vernonia cinerea* Lessing).—For more than 50 years the ironweed has had a foothold in Honolulu, where it is very common on some lawns and on roadsides. It is a fine, slender plant, ranging in height from several inches to a foot or two and is whitish because of a covering of short, white down. Few and narrow leaves grow in the upper part of the plant, the top of which bears a cluster of small, lavender flower heads.

Leaves.—Alternate, with pinnate veins; upper leaves few, narrow; lower leaves ovate to lanceolate, some toothed or wavy margined, with winged stem. *Flowers*.—At end of stem in a leafless panicle, several small lavender heads; florets tubular, 5-cleft, perfect; bracts acute, overlapping, not exceeding florets. *Fruit*.—Achenes cylindrical, hairy, hardly grooved; pappus white, outer row short or reduced to bristles. *Home*.—Tropical countries.



FIGURE 71.—Aster family: mambo (*Carthamus tinctorius*), leaves and flowering head.

False saffron, safflower, mambo (*Carthamus tinctorius* Linnaeus). Figure 71.—A small spiny-leaved plant from the Eastern Hemisphere that somewhat resembles the thistle has been cultivated in Hawaii for at least half a century. It is called “mamo” by the Hawaiians because its flowers resemble in color the yellow-orange feathers of a native bird, the mamo. Its scientific name, *Carthamus*, which is Arabic, also refers to the color. The plant is a smooth, branching annual, growing one to three feet high, and is well provided with oval, spiny leaves. Also the globular base of the flower head is clothed with spiny, leaf-like scales. The globular top is crowded with orange florets, from which in some countries a dye is extracted and used instead of the true saffron. In Honolulu the flowers can be bought at the florists’. They are made into beautiful leis and into floral pieces. The plant is cultivated by the Japanese for its medicinal properties.

LIST OF PLANTS ACCORDING TO HOME LAND

AFRICA

<i>Adansonia digitata</i>	<i>Ficus benghalensis</i>
<i>Agapanthus umbellatus</i>	<i>Hibiscus cameroni</i>
<i>Aloe</i> spp.	<i>Hibiscus schizopetalus</i>
<i>Asparagus plumosus</i>	<i>Hymenocallis</i> sp.
<i>Asparagus sprengeri</i>	<i>Ipomoea palmata</i>
<i>Asplenium nidus</i>	<i>Kigelia africana</i>
<i>Bauhinia tomentosa</i>	<i>Moraea iridioides</i>
<i>Carissa</i> sp.	<i>Nelumbium speciosum</i>
<i>Ceiba pentandra</i>	<i>Noronhia emarginata</i>
<i>Chrysalidocarpus lutescens</i>	<i>Odontosoria chinensis</i>
<i>Clerodendron thomsonae</i>	<i>Phoenix dactylifera</i>
<i>Coffea arabica</i>	<i>Platycerium alaicorne</i>
<i>Coffea liberica</i>	<i>Plumbago auriculata</i>
<i>Colvillea racemosa</i>	<i>Ravenala madagascariensis</i>
<i>Crinum giganteum</i>	<i>Sesbania sesban</i>
<i>Cryptostegia grandiflora</i>	<i>Spathodea campanulata</i>
<i>Delonix regia</i>	<i>Stephanotis floribunda</i>
<i>Dombeya spectabilis</i>	<i>Strelitzia reginae</i>
<i>Dracaena</i> spp.	<i>Tamarindus indica</i>
<i>Elaeis guineensis</i>	<i>Tecomaria capensis</i>
<i>Erythrina abyssinica</i>	<i>Thunbergia alata</i>
<i>Euphorbia splendens</i>	<i>Thunbergia erecta</i>
<i>Euphorbia tirucalli</i>	<i>Tricholaena rosea</i>
	<i>Tritonia</i> sp.

AMERICA

<i>Agave americana</i>	<i>Eichhornia speciosa</i>
<i>Anona muricata</i>	<i>Enterolobium cyclocarpum</i>
<i>Anthurium</i> spp.	<i>Euphorbia heterophylla</i>
<i>Averrhoa carambola?</i>	<i>Euphorbia pilulifera</i>
<i>Bauhinia monandra?</i>	<i>Haematoxylon campechianum</i>
<i>Bignonia jasminoides</i>	<i>Heliconia</i> spp.
<i>Bignonia regina</i>	<i>Hippeastrum equestre</i>
<i>Bignonia unguis-cati</i>	<i>Hymenocallis</i> spp.
<i>Bixa orellana</i>	<i>Ipomoea bona-nox</i>
<i>Brunfelsia</i> sp.	<i>Ipomoea quamoclit</i>
<i>Calliandra haematoma</i>	<i>Jatropha curcas</i>
<i>Canna edulis</i>	<i>Jatropha multifida</i>
<i>Capsicum frutescens</i>	<i>Laelia</i> spp.
<i>Cassia bicapsularis</i>	<i>Lantana camara</i>
<i>Castanea dentata</i>	<i>Leucaena glauca</i>
<i>Cattleya</i> spp.	<i>Mammea americana</i>
<i>Cestrum nocturnum</i>	<i>Mucuna urens</i>
<i>Coccoloba uvifera</i>	<i>Nymphaea</i> spp.
<i>Cordia sebestena</i>	<i>Opuntia tuna</i>
<i>Crescentia cujete</i>	<i>Passiflora laurifolia</i>
<i>Dieffenbachia</i> spp.	<i>Passiflora quadrangularis</i>
<i>Duranta repens</i>	<i>Pereskia bleo</i>

AMERICA—*Continued*

<i>Persea americana</i>	<i>Schinus molle</i>
<i>Petraea volubilis</i>	<i>Selenicereus grandiflorus</i>
<i>Piscidia erythrina</i>	<i>Stachytarpheta dichotoma</i>
<i>Pithecolobium dulce</i>	<i>Tecoma</i> sp.
<i>Plumeria acutifolia</i>	<i>Tecoma stans</i>
<i>Plumeria rubra</i>	<i>Thevetia neriifolia</i>
<i>Prosopis juliflora</i>	<i>Tillandsia usneoides</i>
<i>Psidium guajava</i>	<i>Verbena litoralis</i>
<i>Samanea saman</i>	<i>Zephyranthes</i> spp.
<i>Sapindus saponaria</i>	

ARIZONA

Cupressus arizonica

ASIA

<i>Adenanthera pavonina</i>	<i>Ficus heterophylla</i>
<i>Aleurites moluccana</i>	<i>Ficus retusa</i>
<i>Alocasia macrorrhiza</i>	<i>Hemerocallis flava</i>
<i>Arundo donax</i>	<i>Hemerocallis fulva</i>
<i>Asplenium nidus</i>	<i>Hoya carnosa</i>
<i>Averrhoa carambola?</i>	<i>Jasminum multiflorum</i>
<i>Bauhinia tomentosa</i>	<i>Lagerstroemia indica</i>
<i>Caryota urens</i>	<i>Lagerstroemia speciosa</i>
<i>Cassia fistula</i>	<i>Lawsonia inermis</i>
<i>Cassia glauca</i>	<i>Morinda citrifolia</i>
<i>Cassia nodosa</i>	<i>Morus nigra</i>
<i>Ceiba pentandra</i>	<i>Murraya exotica</i>
<i>Citrus aurantium</i>	<i>Musa sapientum</i> and var. <i>rubra</i>
<i>Citrus grandis</i>	<i>Nelumbium speciosum</i>
<i>Citrus sinensis</i>	<i>Nerium indicum</i>
<i>Cocos nucifera</i>	<i>Nymphaea</i> spp.
<i>Coffea arabica</i>	<i>Odontosoria chinensis</i>
<i>Coix lacryma-jobi</i>	<i>Olea europea</i>
<i>Colocasia antiquorum</i> var. <i>esculenta</i>	<i>Oryza sativa</i>
<i>Cordia myxa</i>	<i>Pandanus tectorius</i>
<i>Cordia subcordata</i>	<i>Phoenix dactylifera</i>
<i>Cordyline terminalis</i>	<i>Pluchea indica</i>
<i>Crinum asiaticum</i>	<i>Pongamia pinnata</i>
<i>Crotalaria fulva</i>	<i>Punica granatum?</i>
<i>Curculigo recurvata</i>	<i>Saccharum officinarum</i>
<i>Erythrina indica</i>	<i>Sesbania sesban</i>
<i>Eugenia jambolana</i>	<i>Tamarindus indica</i>
<i>Eugenia jambos</i>	<i>Terminalia catappa</i>
<i>Eugenia malaccensis</i>	<i>Thuya orientalis</i>
<i>Ficus benamina</i>	<i>Tournefortia argentea</i>
<i>Ficus elastica</i>	<i>Trachycarpus excelsus</i>

AUSTRALIA

<i>Acacia decurrens</i> and var.	<i>Erythrina indica</i>
<i>Acacia melanoxylon</i>	<i>Eucalyptus citriodora</i>
<i>Actinophloeus macarthurii</i>	<i>Eucalyptus globulus</i>
<i>Agathis robusta</i>	<i>Eucalyptus robusta</i>
<i>Araucaria bidwillii</i>	<i>Eugenia jambolana</i>
<i>Araucaria cunninghamii</i>	<i>Ficus macrophylla</i>
<i>Araucaria excelsa</i>	<i>Grevillea robusta</i>
<i>Archontophoenix alexandrae</i>	<i>Hoya carnosa</i>
<i>Brachychiton acerifolium</i>	<i>Ipomoea insularis</i>
<i>Brassaia actinophylla</i>	<i>Macadamia ternifolia</i>
<i>Cassia glauca</i>	<i>Morinda citrifolia</i>
<i>Casuarina glauca</i>	<i>Murraya exotica</i>
<i>Casuarina quadrivalvis</i>	<i>Peltophorum inerme</i>
<i>Casuarina torulosa</i>	<i>Platycerium alcorniae</i>
<i>Cedrela australis</i>	<i>Platycerium grande</i>
<i>Cordia myxa</i>	<i>Pluchea indica</i>
<i>Cordia subcordata</i>	<i>Pongamia pinnata</i>
<i>Cordyline terminalis</i>	<i>Sesbania grandiflora</i> and var.
<i>Crinum pedunculatum</i>	<i>Sesbania sesban</i>
<i>Curculigo recurvata</i>	<i>Tournefortia argentea</i>

BERMUDA

Juniperus bermudiana

BRAZIL

<i>Allamanda blanchetii</i>	<i>Eugenia uniflora</i>
<i>Alternanthera versicolor</i>	<i>Manihot glaziovii</i>
<i>Bignonia venusta</i>	<i>Mimosa pudica</i>
<i>Billbergia thyrsoidea</i>	<i>Paspalum dilatatum</i>
<i>Bougainvillea glabra</i>	<i>Passiflora edulis</i>
<i>Bougainvillea spectabilis</i> and var.	<i>Passiflora foetida</i>
<i>Carica papaya</i>	<i>Physalis peruviana</i>
<i>Cocos plumosa</i>	<i>Psidium cattleianum</i> and var.
<i>Cocos romanzoffiana</i>	<i>Schinus molle</i>
<i>Dioclea violacea</i>	<i>Stigmaphyllon ciliatum</i>
<i>Erythrina cristagalli</i>	<i>Tibouchina granulosa</i>
<i>Eugenia brasiliensis</i>	<i>Zygocactus truncatus</i>

CALIFORNIA

<i>Cupressus macrocarpa</i>	<i>Washingtonia robusta</i>
<i>Erythra armata</i>	

CANARY ISLANDS

Phoenix canariensis

CENTRAL AMERICA

<i>Attalea cohune</i>	<i>Solanum wendlandii</i>
<i>Cassia grandis</i>	<i>Swietenia macrophylla</i>
<i>Jatropha podagrica</i>	<i>Tacsonia vitifolia</i>
<i>Oreodoxa regia</i>	

CHINA

<i>Ardisia crenulata</i>	<i>Erythrina fusca</i> and var.
<i>Bauhinia corymbosa</i>	<i>Gardenia florida</i>
<i>Belamcanda chinensis</i>	<i>Hibiscus mutabilis</i>
<i>Cinnamomum camphora</i>	<i>Hibiscus rosa-sinensis</i>
<i>Citrus japonica</i> and var.	<i>Litchi chinensis</i>
<i>Citrus nobilis</i>	<i>Livistona chinensis</i>
<i>Clerodendron fragrans</i>	<i>Musa cavendishii</i>
<i>Clerodendron squamatum</i>	<i>Rhaphis flabelliformis</i>
<i>Cupressus funebris</i>	<i>Zingiber officinale</i>
<i>Eriobotrya japonica</i>	

EASTERN HEMISPHERE

<i>Albizia lebbek</i>	<i>Hibiscus syriacus</i>
<i>Calophyllum inophyllum</i>	<i>Hibiscus tiliaceus</i>
<i>Carissa</i> sp.	<i>Nerium oleander</i>
<i>Carthamus tinctorius</i>	<i>Pancratium</i> spp.
<i>Datura fatuosa</i>	<i>Rosa</i> spp.
<i>Dendrobium</i> spp.	<i>Sterculia foetida</i>
<i>Ficus carica</i>	<i>Tamarix</i> sp.
<i>Hibiscus sabdariffa</i>	<i>Thespesia populnea</i>

EAST INDIES

<i>Actinophloeus macarthurii</i>	<i>Crotalaria sericea</i>
<i>Albizia saponaria</i>	<i>Emilia sonchifolia</i>
<i>Alpinia nutans</i>	<i>Ixora macrothyrsa</i>
<i>Bauhinia binata</i>	<i>Macaranga grandifolia</i>
<i>Cajanus indicus</i>	<i>Mucuna gigantea</i>
<i>Canarium odoratum</i>	<i>Paederia foetida</i>
<i>Cinnamomum zeylanicum</i>	<i>Zizyphus jujuba</i>
<i>Clerodendron fragrans</i>	

ECUADOR

Sanchezia nobilis

EUROPE

<i>Arctium lappa</i>	<i>Hemerocallis fulva</i>
<i>Arundo donax</i>	<i>Nymphaea</i> spp.
<i>Cupressus sempervirens</i>	<i>Punica granatum</i>
<i>Hemerocallis flava</i>	

FIJI

Pritchardia thurstoni

GUIANA

<i>Allamanda hendersoni</i>	<i>Canna indica</i>
<i>Ananas sativus</i>	

HAWAII

<i>Acacia koa</i>	<i>Hibiscus youngianus</i>
<i>Alyxia olivaeformis</i>	<i>Lycium sandwicense</i>
<i>Cibotium chamissoi</i>	<i>Metrosideros polymorpha</i>
<i>Cuscuta sandwichiana</i>	<i>Pipturus albidus</i>
<i>Dracaena aurea</i>	<i>Pritchardia martii</i>
<i>Erythrina monosperma</i>	<i>Sadleria cyatheoides</i>
<i>Freycinetia arborea</i>	<i>Scaevola chamissoniana</i>
<i>Hibiscus arnottianus</i>	<i>Sida fallax</i> var.

INDIA

Acacia catechu	Euphorbia trigona
Adansonia digitata	Ficus benghalensis
Albizzia marginata	Ficus religiosa
Artabotrys uncinatus	Garcinia xanthochymus
Artocarpus integrifolia	Hedychium coronarium
Bambusa vulgaris	Hedychium flavum
Barleria cristata	Hedychium gardnerianum
Barringtonia speciosa	Holmskioldia sanguinea
Bauhinia binata	Ipomoea horsfalliae
Bauhinia monandra?	Kleinhofia hospita
Bauhinia purpurea	Lonicera japonica
Beaumontia grandiflora	Mangifera indica
Calotropis gigantea	Melia azederach
Canarium odoratum	Phalaenopsis spp.
Cassia siamea	Phoenix sylvestris
Chaetochloa palmifolia	Sansevieria zeylanica
Citrus aurantifolia	Sesbania grandiflora and var.
Citrus limonia	Sterculia urens
Clerodendron squamatum	Tectona grandis
Dracaena spp.	Thunbergia grandiflora
Euphorbia antiquorum	Zingiber officinale
Euphorbia tirucalli	Zingiber zerumbet

JAPAN

Alocasia sp.	Eriobotrya japonica
Buddleia japonica	Gardenia florida
Cinnamomum camphora	Ipomoea spp.
Citrus japonica and var.	Ligustrum ovalifolium
Cryptomeria japonica	Rhaphis flabelliformis
Cycas revoluta	

JAVA

Coleus blumei and vars.	Livistona rotundifolia
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LORD HOWE ISLAND

Denea forsteriana	Howea belmoreana
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MALAYSIA

Adenanthera pavonina	Ixora macrothyrsa
Albizzia saponaria	Mangifera indica
Artocarpus incisa	Mucuna gigantea
Artocarpus integrifolia	Paederia foetida
Cassia siamea	Peltophorum inerme
Casuarina equisetifolia	Phalaenopsis spp.
Cinnamomum zeylanicum	Platynerium grande
Codiaeum variegatum	Quisqualis indica
Ficus benjamina	Sesbania grandiflora and var.
Ficus retusa	Tectona grandis
Garcinia xanthochymus	Zizyphus jujuba
Globba sp.	

MASCARENE ISLANDS

<i>Dictyosperma alba</i> var. <i>rubra</i>	<i>Pandanus sylvestris</i>
<i>Hyophorbe amaricaulis</i>	<i>Phacomeria speciosa</i>
<i>Latania loddigesii</i>	<i>Zoysia tenuifolia</i>

MEXICO

<i>Agave rigida</i>	<i>Rondeletia odorata</i>
<i>Antigonon leptopus</i>	<i>Russelia juncea</i>
<i>Bryophyllum calycinum</i>	<i>Solandra guttata</i>
<i>Epiphyllum oxypetalum</i>	<i>Solanum macrophyllum</i>
<i>Euphorbia pulcherrima</i>	<i>Thevetia iccotli</i>
<i>Hylocereus undatus</i>	<i>Tithonia diversifolia</i>
<i>Mirabilis jalapa</i>	<i>Vanilla planifolia</i>
<i>Monstera deliciosa</i>	<i>Zebrina pendula</i>
<i>Rhoeo discolor</i>	

MOLUCCAS

<i>Canarium commune</i>	<i>Cycas circinalis</i>
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NEW CALEDONIA

<i>Araucaria cookii</i>	<i>Platycerium alcorni</i>
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NEW GUINEA

<i>Polypodium phymatodes</i>

NORFOLK ISLAND

<i>Araucaria excelsa</i>

NORTH AMERICA

<i>Argemone</i> sp.	<i>Washingtonia filifera</i>
<i>Erigeron canadensis</i>	<i>Yucca gloriosa</i>
<i>Vitis labrusca</i>	

PACIFIC ISLANDS

<i>Acalypha wilkesiana</i>	<i>Morinda citrifolia</i>
<i>Aleurites moluccana</i>	<i>Murraya exotica</i>
<i>Artocarpus incisa</i>	<i>Musa fehi</i>
<i>Asplenium nidus</i>	<i>Nothopanax guilfoylei</i>
<i>Barringtonia speciosa</i>	<i>Odontosoria chinensis</i>
<i>Cassia glauca</i>	<i>Pandanus tectorius</i>
<i>Casuarina equisetifolia</i>	<i>Pandanus veitchii</i>
<i>Dioscorea bulbifera</i>	<i>Peltophorum inerme</i>
<i>Dracaena</i> spp.	<i>Phyllanthus nivosus</i>
<i>Eugenia malaccensis</i>	<i>Pritchardia pacifica</i>
<i>Fagraea berteriana</i>	<i>Zingiber zerumbet</i>
<i>Graptophyllum pictum</i>	

PERSIA

<i>Cupressus sempervirens</i>

PERU

<i>Abutilon molle</i>

SOLOMON ISLANDS

<i>Muehlenbeckia platyclada</i>	<i>Pothos aureus</i>
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SOUTH AMERICA

Achmea sp.	Cereus peruvianus
Achras sapota	Cortaderia argentea
Allamanda cathartica	Datura arborea
Anona cherimolia	Indigofera anil
Bidens pilosa	Jacaranda ovalifolia
Bombax ellipticum	Nicotiana glauca
Caladium bicolor	Passiflora alata
Cassia moschata	Pedilanthus tithymaloides

TROPICAL COUNTRIES

Abrus precatorius	Ipomoea batatas
Acacia farnesiana	Ipomoea pes-caprae
Adiantum spp.	Jatropha spp.
Amarantus speciosus	Lochnera rosea
Caesalpinia pulcherrima	Malvastrum coromandelianum
Cassia alata	Nephrolepis exaltata
Cassia mimosoides	Panicum maximum
Cenchrus echinatus	Paspalum conjugatum
Chloris paraguayensis	Phaseolus semierectus
Clitorea ternatea	Portulaca oleracea
Commelina benghalensis	Rhaphis aciculata
Commelina nudiflora	Ricinus communis
Gleichenia linearis	Scaevola koenigii
Gliricidia sepium	Spondias dulcis
Gossypium barbadense	Spondias lutea
Heteropogon contortus	Stenotaphrum secundatum
Hydrocotyle asiatica	Vernonia cinerea

WEST INDIES

Anona reticulata	Chrysophyllum monopyrenum
Anona squamosa	Coccothrinax argentea
Batis maritima	Cordia collococca
Bidens pilosa	Ipomoea tuberosa
Caesalpinia crista	Oreodoxa regia
Canna indica	Pimenta officinalis
Catalpa longissima	Rhoeo discolor
Cestrum diurnum	Rondeletia odorata
Chrysophyllum cainito	

WORLDWIDE

Aristolochia spp.	Datura stramonium
Cynodon dactylon	Sonchus oleraceus
Cyperus rotundus	Xanthium strumarium var.
Cyperus spp.	

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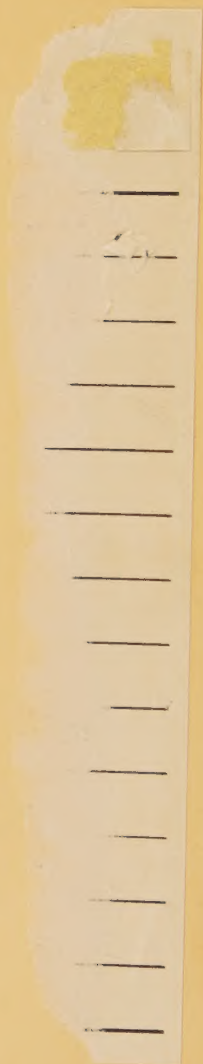
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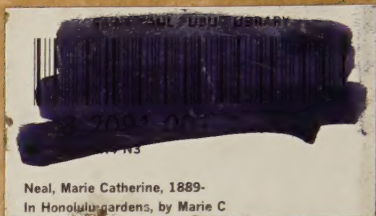
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